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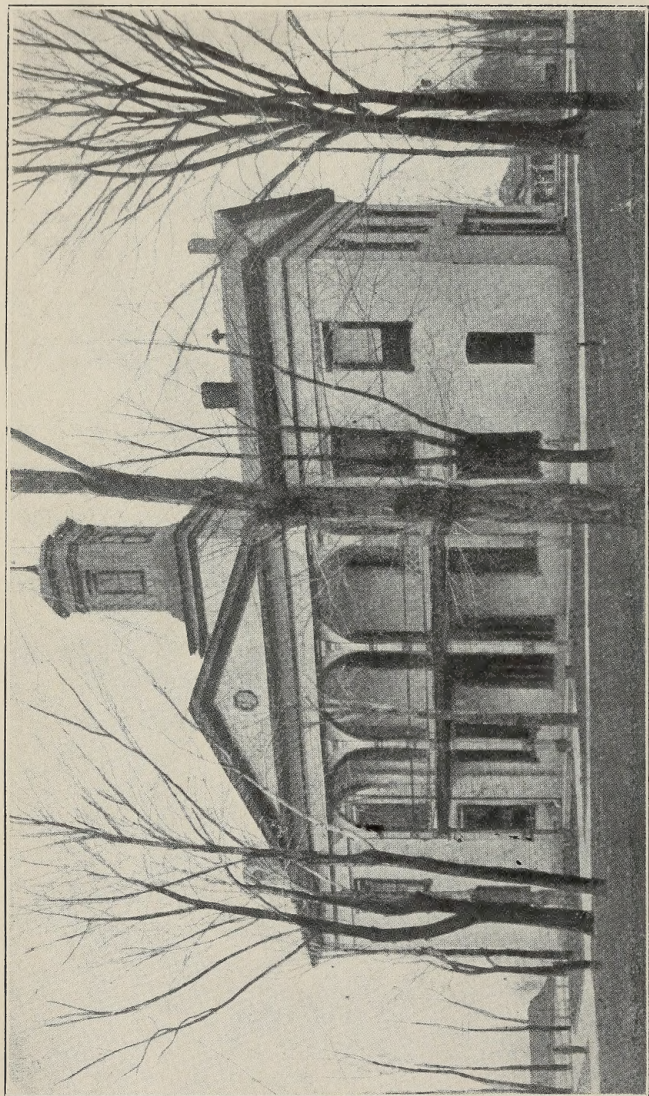
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Second State Capitol, erected 1836, now the Fayette County Court House, Vandalia, Ill. A building famous in the early history of Illinois, for its association with Lincoln and other characters of undying fame. Was built by Col. Jas. T. B. Stapp, Levi Davis, and Alexander P. Field, at a cost of \$16,000. It was remodeled in 1859, and again in 1902, and is a handsome, stately structure that seems to reflect past glories.

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PROCEEDINGS OF THE
Thirty-Sixth Annual Meeting
OF THE
Illinois State Dairymen's
Association.

HELD AT
VANDALIA, ILLINOIS,
January 19, 20 and 21, 1910.

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*News-Advocate Print,
ELGIN, ILLINOIS.*

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Letter of Transmittal.

Office of Secretary,
Illinois State Dairymen's Association,
Chicago, Ill., 1910.

To His Excellency, Charles S. Deneen, Governor of the State of
Illinois:

I have the honor to submit the official report of the Illinois
State Dairymen's Association, containing the addresses, papers,
and discussions at its thirty-sixth annual meeting, held at Van-
dalia, Illinois, January 19, 20, 21, 1910.

Respectfully,

GEO. CAVEN, Secretary.

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List of Officers.

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L. N. WIGGINS, Springfield.

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CHAS. GILKERSON, Marengo.

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JOSEPH NEWMAN, Elgin.

L. N. WIGGINS, Springfield.

JOHN LYNCH, Olney.

Secretary—

GEO. CAVEN, Chicago.

Treasurer—

CHAS. FOSS, Cedarville.

By-Laws of the Illinois State Dairymen's Association.

Officers.

Section 1.—The officers of the Association shall consist of a President, Vice President, Secretary, Treasurer and Board of Directors, composed of seven members, of whom the President and Vice President of the Association shall be members and the President ex-officio Chairman.

Duties of the President.

Sec. 2.—The President shall preside at the meetings of the Association and of the Board of Directors. It shall be his duty, together with the Secretary of the Board of Directors to arrange a program and order of business for each regular annual meeting of the Association and of the Board of Directors, and upon the written request of five members of the Association it shall be his duty to call special meetings. It shall be his further duty to call on the State Auditor of Public Accounts for his warrant on the State Treasurer, for the annual sum appropriated by the Legislature for the use of this Association, present the warrant to the Treasurer for payment, and on receiving the money receipt for the same, which he shall pay over to the Treasurer of the Association, taking his receipt therefor.

Duties of the Vice President.

Sec. 3.—In the absence of the President his duties shall devolve upon the Vice President.

Duties of the Secretary.

Sec. 4.—The Secretary shall record the proceedings of the Association and of the Board of Directors. He shall keep a list of the members, collect all the moneys due the Association (other than the legislative appropriations), and shall record the amount with the name and postoffice address of the person so paying, in a book to be kept for that purpose. He shall pay over all such moneys to the Treasurer, taking his receipt therefor. It shall also be his duty to assist in making the program for the annual meeting and at the close of the said meeting compile and prepare for publication all papers, essays, discussions and other matter worthy of publication, at the earliest day possible, and shall perform such other duties pertaining to his office as shall be necessary.

Duties of the Treasurer.

Sec. 5.—The Treasurer shall, before entering on the duties of his office, give a good and sufficient bond to the Directors of the Association, with one or more sureties, to be approved by the Board of Directors, which bond shall be conditioned for a faithful performance of the duties of his office. He shall account to the Association for all moneys received by him by virtue of said office and pay over the same as he shall be directed by the Board of Directors. No moneys shall be paid out by the Treasurer except upon an order from the Board, signed by the President and countersigned by the Secretary. The books or accounts of the Treasurer shall at all times be open to the inspection of the members of the Board of Directors, and he shall, at the expiration of his term of office, make a report to the Association of the conditions of its finances, and deliver to his successor the books of account together with all moneys and other property of the Association in his possession or custody.

Duties of the Board of Directors.

Sec. 6.—The Board of Directors shall have the general management and control of the property and affairs of the Association, subject to the By-Laws.

Four members of the Board shall constitute a quorum to do business.

The Board of Directors may adopt such rules and regulations as they shall deem advisable for their government, and may appoint such committees as they shall consider desirable.

They shall also make a biennial report to the Governor of the State of the expenditures of the moneys appropriated to the Association, and arrange the program and order of business for the same.

Election of Officers.

Sec. 7.—The President, Vice President and Board of Directors shall be elected annually by ballot at the first annual meeting of the Association.

The Treasurer and Secretary shall be elected by the Board of Directors.

The officers of the Association shall retain their offices until their successors are chosen and qualify.

A plurality vote shall elect.

Vacancies occurring shall be filled by the Board of Directors until the following annual election.

Membership.

Sec. 8.—Any person may become a member of this Association by paying the Treasurer such membership fee as shall from time to time be prescribed by the Board of Directors.

Quorum.

Sec. 9.—Seven members of the Association shall constitute a quorum for the transaction of business but a less number may adjourn.

Annual Assessment.

Sec. 10.—One month prior to the annual meeting in each year the Board of Directors shall fix the amount, if any, which may be necessary to be paid by each member of the Association as an annual due.

Notice of such action must be sent to each member within ten days thereafter, and no member in default in payment thereof shall be entitled to the privileges of the Association.

Amendment of By-Laws.

Sec. II.—These By-Laws may be amended at any annual meeting by a vote of not less than two-thirds of the members present. Notice of the proposed amendment must be given in writing, and at a public meeting of the Association, at least one day before any election can be taken thereon.

PROCEEDINGS
OF THE
Thirty-Sixth Annual Convention
OF
Illinois State Dairymen's Association
HELD AT
Vandalia, Illinois, January 19, 20 and 21, 1910.

The Illinois Dairymen's Association met in annual session at the Armory, in Vandalia, Illinois, January 19, 1910, at 10:30 A. M. President L. N. Wiggins in the chair.

The convention was opened with prayer by the Reverend Mr. Hall.

Mr. Hall: God, our Heavenly Father, we rejoice this morning in Thy loving kindness and all Thy tender mercies. We praise Thee for health, for love and strength and for this beautiful day and for all Thy blessings, and for the way that Thou has led us, the people of this world, and for bringing us into the light, where the light shines brighter and brighter, and along the avenues of life we can find the richness of Thy hand and Thy divine presence has been with us.

We thank Thee for the beginning of this, the 36th Annual Convention of the Illinois State Dairymen's Association. We pray Thy blessing upon these gentlemen. We pray that Thou will lead and guide them, so that in all their deliberations they may have the protection of Almighty God, for Jesus' sake. Amen.

ADDRESS OF WELCOME

By

Dr. T. J. Cummings.

Chairman:—The citizens of Vandalia have done everything in their power to make this meeting a success. We are deeply grateful to them, and in the absence of the Mayor, Mr. Cummings is here to extend to us the glad hand. I take pleasure in introducing Mr. Cummings.

Mr. T. J. Cummings:—Mr. President, Members of the Illinois State Dairymen's Association: The Mayor of the City of Vandalia has delegated to me the honor of representing him in extending to you a welcome to the old capital city. Unfortunately the Mayor could not be here in person today, but he instructed me to leave no doubt in your minds as to the sincerity of your welcome.

The people of Vandalia appreciate the honor you have bestowed upon them in selecting this city for your 36th annual convention. We are fully alive to the merits of your work and to the importance of your labor in Fayette County. We have one of the largest counties in area in the State of Illinois, and throughout that country we have many thousand acres of fertile soil. But this soil I do not intend to speak to you about today, yet on the other hand we have thin soil which is not so productive. This thin soil when properly fertilized will produce blue grass and clover, and gentlemen, the importance of your work here today, as well as in the past and in the future appeals most strongly to those who own this thin soil throughout the state. And I believe unless a man adopts in an intelligent manner the dairy methods practiced by you gentlemen, that those farms will be forever unproductive. Some feel that our farmers should endeavor to try the artificial fertilizer; but this we fear would exceed the the value of the lands themselves. If you gentlemen would not only point out the way to them how they could not only bring up their lands to a higher state of cultivation, but tell

them how they can make money, teach them the sanitary methods of all dairy products, teach them how to make two pounds of butter cost them no more than it did in former times to make one, and pure butter too.

In that way, gentlemen, you create prosperity, and your work is a noble one, in fact, gentlemen, you bring prosperity to a community.

The citizens of this city have thrown open wide the doors of hospitality and bid you enter, and in the name of the Mayor I take great pleasure in extending to you a hearty and cordial welcome to this city.

RESPONSE FOR ASSOCIATION

by

Joseph Newman, Elgin.

Mr. Newman: Mr. Chairman, Ladies and Gentlemen, We always appreciate a hearty welcome into any city we take the Association. We are, as the gentleman has informed you, an educational association, purely, nothing political in its make-up. We shall bring speakers here during the program of the next two or three days that will enlarge on the points the gentleman has brought out. We shall endeavor to tell him, the farmers and the town people, in fact all of Fayette and neighboring counties, if they will come here, that by taking off 100 pounds of butter fat they only take six cents from the soil.

We shall go into details and tell them that they are bringing money into these counties every thirty days, that is far different from the annual money that comes in from any crop of cereal. We shall be able to show them by able speakers that this thin land can be brought up, and at the same time the people shall be able to live and occasionally have pianos. We shall be able to show them also that this thin land, by adopting the best system of agriculture there is, by going into the grasses, and the clover and the alfalfa, they will so enrich that soil that they can return on to the soil a sufficient amount of fertilizer so that they will not have to go to the fertilizer company to produce. Their lands will be brought up in a natural way. It can be done and it will be shown it has been done.

Coming as I do from the north, from a land that overflows with honey and milk as the Good Old Book has told us, the Fox River District, which is the flower in the state, I can say to you that we have been able to do this. Mr. Mason, who is President of the Farmers' Institute, has two farms not to exceed 150 acres in each farm, the soil of which twenty-five years ago was no better than yours here today in some of your thin lands. On those two farms his check during the winter months is not less than \$1,500.00 in cash. He is a practical farmer and what he

has done others can do. Of course, there are few Masons. There are farmers and there are farmers, everyone knows this. One man thinks he knows as much as the other, but does not apply it in a practical way. There are ideals which you can work for. To acquaint you with these we are bringing the dairy association to this section, and we have made a business of working in Southern Illinois for the last few years. We have met in Glenville, we have met in Effingham, and now in this beautiful town. This shows you that the people in the north are not selfish. They bring the association to your own door with a small cost to you. It is a nominal cost to pay the actual expenses of a convention and we hope that it will reimburse you a thousand fold as compared to what the citizens pay out.

We shall try to show you that our great bug bear is the oleomargarine question. We shall try to show you that the price of butter is the foundation of all prices, whether it is from a city milk standpoint, whether it is from a condenser's standpoint or whether it is from a butter standpoint. All of these large companies which you hear spoken of as trusts, although I do not believe there is a trust in this country in any line in the dairy interests, unless it is the oleomargarine follow the butter price. We shall show you that as the price of butter advances, you will find that the price of the condenser's contract is enlarged. That has been so for the past three years. This last winter, I believe, the ordinary price of the condenser was \$1.75 per hundred pounds. That takes the skim milk from the farm, the butter does not take the skim milk from the farm. In the skim milk is found the great value to the soil; the protin is the large element in the skim milk, and that is fed to the hogs and calves. In that way those that sell just their cream will find they build up their farms faster without buying the fertilizers, which will be necessary if they sell their milk. These questions will be brought out in detail; I am just touching on them to show this gentleman who brought this subject up.

On the oleomargarine question, I am pleased to say to you, and this is the first meeting we have been able to say it, our laws are being enforced. The Illinois law is the most strict of any state in the Union. The Supreme Court has lately given a decision of constitutionality, but it has taken since 1897 to get it. Oleomargarine sold under the color and semblance of butter is

not permitted at all. You may think that is a stringent law, but if I could take you into our large cities where the fat of the hog is colored up to look like the fat of the good old cow, then you will say it is a righteous law. You can hardly hope that every State in the Union will have this law, but we hope other dairy States will have it and back up Illinois. You will have other speakers who will go further into this subject with you.

We are very glad indeed that the doors of Vandalia are thrown open to us. We shall try to behave that the calaboose will not find us and we can promise you that you can throw your key to it into the Kaskaskia River, for you will not need it.

We shall hope that the citizens will turn out to our meetings. I hope the men of Vandalia will see that their wives, their sweet-hearts and their sisters are here. You will be surprised how the ladies, in talking at their sewing societies or their card parties, will disseminate this knowledge. What we want is the dissemination of this knowledge. Knowledge is easy to get. We have urged our University to have a department to spread this knowledge, and the past two years they have done admirable work. It is fully as important to distribute knowledge as it is to gather this knowledge at the University. It is all right to have a splendid University to gather this knowledge, but if they keep it what good is it to you and what good would it do to the farmer who hardly ever goes out of his own town?

With this, Mr. Chairman, I think I will be excused. Thank you for inviting us here.

Chairman:—It is customary and I guess necessary to have the President's address at one of these meetings. Mr. Caven insists on having it on the program, and what I have to say will not detain you but a moment. I have jotted down a few memorandums which I will read to you, briefly expressing my views at these meetings.

PRESIDENT'S ADDRESS

Lewis N. Wiggins, Springfield.

Mr. Wiggins: Ladies and Gentlemen: It is thirty-six years since this Association was organized. Its growth has been sound and development steady. Year after year its officers and members have endeavored to promote and help the dairyman and the dairy industry.

It has brought dairy life and development into all parts of the state. It has carefully and quietly worked out many of the difficult dairy problems, until today Illinois holds first place in the importance of her dairy interests.

However, it is of vital importance that this Association continues in its strong development, and that all men and women interested in the dairy industry lend it their hearty support. By an earnest effort on the part of each member it will be better able to watch over and assist in the development of our common interest.

The natural resources and short distance to large markets insure for the dairyman in this state a bright future. "The Elgin District" is no longer the only important dairy district of this state. The southern counties have just as many natural advantages for the dairy business, and it is very gratifying to note the rapid progress made in this section of the state.

I would like to impress upon you the importance of starting the cow business in the proper way. With the higher land values, higher prices for grain and forage it is most essential that you breed herds of high breeding and high producing qualities. If you think you cannot afford to buy pure bred cows, buy a pure bred sire and one pure bred cow. Be sure these are from producing families and not picture families. Insist upon being furnished with records of yearly productions of the dams. You can no more afford to raise grade dairy cows than the modern factory can afford to continue to use, year after year, the old ma-

chinery. It is necessary to add from time to time new machines of modern efficiency and perfection. It costs no more to operate them and the producing powers are greater and the finished products better. Do not forget the important fact that your cow is a live machine, a most complicated and yet simple one. If she is properly fed the raw material, and you, the operator, use good common horse sense she will turn out for you a good finished product.

Milk is the most important article of food we use in our homes. The health and integrity of our people depend upon the quality of milk our children are raised upon. On the dairy farm we are inclined to overlook the health standpoint and reach only for the dollars our cows will bring in. Do not be afraid of modern sanitary methods for producing and caring for milk. The very life of our dairy herd depends upon the sanitary conditions of our stables and the health of the cows.

Our National and State Agricultural Schools are employing the best talent in the world to investigate the best methods of conducting the dairy business; do not fail to grasp the opportunities of obtaining knowledge from them.

With increased cost of producing dairy products we are bound to meet with considerable difficulty in securing a sufficient increase in the selling price so as to allow us to make a reasonable profit. I believe the public are willing to pay a fair price for the good products. But we dairymen will have to promote quite a campaign of education to demonstrate what good products are.

Our creamery men in the past year have done a large business and obtained satisfactory prices for their products. They have found it necessary to be constantly on the alert to prevent the unlawful competition of oleomargarine factories. We must all be united in this matter and be constantly on guard to protect our dairy products. We should not neglect a single opportunity to impress upon Congress and the Legislature the importance of protecting pure butter against the counterfeit products of cotton seed oil and packing house fats. Congress provides for the manufacture of oleo and we cannot restrict the output, but we can consistently insist that it be sold as oleo and not as pure butter. We must see that it is properly labeled and stamped.

We have reason to be proud of our wonderful State Fair, but especially of the magnificent show, of late years, of dairy cattle. under the wise supervision and untiring efforts of Superintendent Honorable A. O. Auten, this department has grown by leaps and bounds, and now each year we have the greatest show of dairy cattle to be seen in the entire country. Last year Mr. Auten was given charge of the Dairy Products Building. He is to be congratulated upon the splendid exhibit which he brought together. It is highly important that the dairymen of this state rally to his support and do all they can to assist him to develop this department.

The dairy department of our State Pure Food Commission is represented by a very able man of wide experience. Whenever it is possible to lend him or his associates any assistance it is highly important that you do so.

I wish at this time in behalf of this Association to thank our Secretary, Mr. George Caven, for his loyal and untiring efforts in looking after our affairs. Aside from many other good things, he has organized and held a large number of meetings in different parts of the state. All have been successful and largely attended. They have been a great help to the dairy interests in the communities where they were held. It has been the purpose of your Directors to hold as many of these auxiliary meetings as our finances would permit.

I wish to thank the officers and the standing committees for their hearty support in conducting the affairs of this Association during the past year. I feel that we have made very good progress, but there is still much to accomplish.

Chairman: We are not through with this morning's meeting. Is Mr. Mason in the room? There are a few things that I would like to call your attention to. This afternoon at 1:30 in Machinery Hall, the milk testing contest will be held. Our program has also been changed and at 1:30 in this hall we will have the pleasure of listening to Mr. Rabild, Dairy Division U. S. Department of Agriculture, Mr. Wright, State Dairy and Food Commissioner of Des Moines, Iowa, and Dr. Wright of this state, Chief of the Veterinarian Department, and all of these

talks this afternoon will be of special interest, and I hope you will get the crowd together and be here at 1:30.

Each year the Association gets out a report in the nature of an educational volume. You will find them at this desk. They are free and if they look good to you take one for yourself and then take another home to your neighbor, and please try to get at this meeting during the next two days as many of the local people in as you can persuade to come. I am sure you will find the talks beneficial and very interesting.

Tonight we are to have stereopticon views. Professor Fraser will display his views that he has gathered in the old country. We also have a good musical program tonight that is not shown on our regular program, but the citizens here have promised us good talent and good music.

There are several committees to appoint, among them the Committee on Memberships. In regard to the membership, do not get the idea it is the dollars we want; we want your name on the roll, and of course will take the dollar—that helps.

If we haven't your name on the Association list we don't know how to reach you, and if you are a member you will work a little more strenuously than as if you just came and went away and if any members try to pin on a badge don't shy from it. I would like to call your attention to the place where your name is to be inserted; this enables you to know the other man's name.

On that Membership Committee I would like to appoint:

Joseph Newman, Elgin.

G. G. Council, Vandalia.

J. F. Sanmann, Havana.

Charles Gilkerson, Marengo.

A. F. Jansen, Effingham.

J. P. Mason, Elgin.

E. Sudendorf, Clinton.

I wish that you would get the badges from Mr. Caven and circulate around and get a badge on every one.

The other committees I shall appoint the first thing this afternoon.

At that time I hope we will have Mr. Mason here to give us a little impromptu talk. If there are any questions that you would like to ask on the feeding or care of cows, I would like to have them. We might spend fifteen minutes very profitably.

The possibilities of this section of the state, as Mr. Newman has said, are very great for dairy interests. We no longer feel that we have to go to the northern part of the state to sell our products. The large market of St. Louis makes a ready and a good market, and it seems to me with the price of land, it is a very good opportunity for a man to invest in the dairy business. Of course feed is high, but we are all learning how to make the cow produce more milk for the same money, and it is especially important in these conventions that men become interested and at least investigate the good business that the production of milk and cream will give him. Are there any questions?

State Fair Dairy Exhibit.

Mr. Gilkerson: I would like to say just a word. I see that there are quite a few of the local people here. I would like to say a word in regard to the State Fair next fall. The President has already mentioned it. I wish every one who is here and who has any influence would see that more exhibits are procured for the State Fair. I hope they will use every effort they can.

We are remodeling the premium list to a large extent, and there was more interest developed in the dairy products at the last fair than there has been for a number of years. I wish we could increase that interest and increase the number of exhibits to twice what we had. I do not know the plans fully, but we want every man who makes butter, dairy or creamery, to send a sample to the State Fair, have it scored, and we are going to make plans this year to send every one that has butter there their score. That is the great educational feature in regard to that exhibit. We want to get in touch with every one that is interested. Last year we had 400 entries of butter. We want to double that this year. I do not know what we will be able to

accomplish. We will not accomplish anything unless the people who make the goods are with us.

I do not remember that we had but one entry from Vandalia. We ought to have six from this city, at least, for dairy butter and we ought to have some for creamery butter. Unless the people take an interest the department is not going to grow.

Chairman: I suppose those who were at the State Fair noticed the splendid exhibit of dairy products. Mr. Gilkerson was given charge of that department, and we all felt that he had made wonderful progress. Heretofore the dairy machinery was about crowded out. We had one building devoted to the dairy products this fall. It was packed most of the time and people would come in with the remark that "I did not know you had anything like this on the ground." They would come back and bring their friends.

The success of that building was due to Mr. Auten's and Mr. Gilkerson's efforts.

I would like to impress upon you that the importance and success of these dairy meetings depends largely on the general discussions of subjects brought out by asking questions of the speakers.

When we have men on the platform reading papers, if you will jot down on a piece of paper any questions you may wish to ask and then bring them up at the close of the paper, we will have plenty of time after each number to take up these questions and discuss them properly.

I would like to ask any of the dairymen who live about here to see Mr. Caven and he will show you about entering milk, cream or butter. There are quite a number of entries, but if we had a few more it would make a better showing. Whenever you enter butter or cream and have it tested, you always gain something, and it won't cost you anything to enter.

Do not forget to take some of these reports with you. Take one at least and put it in your library.

If that is all we will adjourn until 1:30 o'clock this afternoon.

Wednesday Afternoon, January 19.

The meeting was called to order by the Chairman and opened with a character song by Misses Agnes Smith and Celia Chandler and Messrs. Ray Conrad and Glen Pfeifer.

Chairman: We are much indebted to the quartette who have so well entertained us.

I find we will have to make a little change on the program. Mr. Hepburn will postpone his address until tomorrow and Mr. Helmer Rabild of the U. S. Department of Agriculture will take his place. I take great pleasure in introducing Mr. Rabild.

COW TEST ASSOCIATIONS.

By

Helmer Rabild, Dairy Division U. S. Department of Agriculture.

Mr. Rabild: After the introduction by your Chairman, I know you expected to hear from a professional. I am a foreigner and I am proud of it and I hope I will succeed in telling you something that may be of interest to you.

Immediately after the disastrous war of 1864 when Denmark lost its dearest possession, Schleswick-Holstein, a numbness seemed to overcome everybody. The blow had been so overwhelming that it seemed almost impossible to recover from it. It was not enough that the war had ended, the cost was still to be paid, and the country was almost devoid of natural resources. There were no woods or mines, and little industrial activity. It became necessary to levy heavy taxes, and the burden of these naturally fell on the only producing resource, the soil. In addition thereto, much of the best soil was in the hands of large land-owners, who enjoyed special privileges with regard to taxes.

and for this reason the small farmer was the one who felt the misfortune of the country in the greatest degree, and upon whom it naturally fell to pay the cost of it. For a long time he staggered under the heavy burden, and if it had not been for the co-operative system the world would probably never have heard of Denmark as a dairy state. But as soon as the Danish farmer began to co-operate with his fellow farmer the prospects for the nation began to grow brighter.

It is difficult to determine what particular man should have the credit for the institution of the co-operative movement. Denmark had heretofore been an exporter of grain, beef and horses. Of these articles the horses went mostly to France, and the grain and beef to England. But it occurred to the English farmer that he might as well raise his own beef and supply the English market himself, instead of sending all that money out of the country, and laws were passed restricting the importing of Danish beef. Without any market, beef raising became prohibitory, and the Danish farmer had lost one of his best sources of income. The government had, in the meantime, conducted numerous experiments in an endeavor to find some other field or system which would make its chief resource, the cultivator of the soil, more prosperous, for he was the one to whom they had to look for the payment of the national debt. It was as the result of these experiments that experts were employed to go out among the farmers and try to get them interested in dairying.

There were, in the farmers' stables at that time a lot of cows of a more or less beefy type, and which did not yield a great profit when used for dairy purposes. The statistics show that the average production of butter per cow in 1884 was only 107 pounds. The problem was to make these cows more profitable, and after much experimenting and more discussion it was finally determined that this could be done by better feeding in connection with better breeding. This called for better bulls, or bulls of the dairy type, and the demand for this kind of bulls became so great and the supply was so limited that the price mounted sky-high; in fact beyond the reach of the common farmer. It

was then that someone suggested that if one man could afford to buy a good dairy bull a number might club together and buy one in partnership, and in this way the first co-operative breeding association was formed. I have known, and I think it to be the general rule, that the price of a good dairy bull amounts to several thousand dollars; and the demand upon the services of a bull became so great and the cost so expensive that it was agreed that only the cows with a certain standard of dairy quality could be entered as eligible to membership in the association. It became necessary to find the productiveness of the cows, and this encouraged the formation of cow test associations.

I remember distinctly when this association was organized in my home county. I worked at home at that time on the farm, and my father was a member of the test association. Usually I did not have anything to do with the cows; we had about eighty cows on my father's farm, and had a man that did not do anything but take care of the cows, and my duty was to look after the work in the field. You can imagine my surprise, one day, when my father told me to stay home from the fields and watch the work in the cow stables. I asked him why, and he said, "We are going to test this afternoon, and there is something to be learned which you cannot afford to miss." I stayed with the tester that day and every day he came after that, and I assure you I began to learn. From that day I began to take more and more interest in the cow and in dairying and I feel that interest has been growing every year since. After the first day's work in the cow stable with the tester, I began to look at the cows in a different light. I could look at the table which was hanging over each cow, showing the amount of milk she gave, the test of that milk, when she came fresh, how old she was, all her history and pedigree, so to speak. I would compare those figures and facts with her form, with her color, with the shape of her horns, and all those things we used to consider had a great influence on the quality of the cow, and I began to learn. I would go in for hours and compare those figures.

About fifteen years ago, as I said, the Danish farmers were

in pretty hard condition. You understand the woods there are all gone, the forests are all gone in Denmark; the land is very high priced, brings from \$100 to \$500 per acre; taxes on that land are from \$2 to \$5 an acre each year; they cannot grow corn because the season is not long enough; they cannot grow wheat profitably, because you American farmers can raise wheat cheaper than they can, and they can buy American wheat cheaper than they can raise it themselves; the natural resources of the country are entirely exhausted, have all been worked out and taken advantage of, and about the only thing left for the Danish farmer is live stock husbandry.

Now, the government of Denmark had looked over the situation very carefully and decided that something had to be done to relieve the industry of the country. The farmers were suffering and, in consequence, all the other industries were suffering. Money was scarce, taxes high, and the people began to go bankrupt. The government investigated the situation and found the thing most adapted for the Danish farmer would be dairying and consequently sent men out among the farmers and tried to encourage dairying, and I assure you they did a good job at it, because today, you all know, that Danish butter brings the highest market price in the world's market. The government took a hand in it, and I believe has done a great deal of good for the dairy industry of Denmark and has taught the government of other states and countries a great lesson. The dairymen began to open their eyes to the importance of keeping records of the performances of their cows; they realized there was need of something of that kind in order to get it down to a reliable basis. As near as I know, we have not, in this country, any of those kinds of records. We have monthly and weekly records, but no yearly records, and while the weekly and monthly record may be a good thing, a sort of indication of what a cow may do, the yearly record is what tells, because we have to feed the cow 365 days in the year, and there is great need of reliable records. Just to give you an idea of what they might teach us, the dairy commissioner of Iowa has gathered statistics on the profits of dairy

cows in the great state of Iowa, and he has found that the butter production from the average cow in Iowa to have been 140 pounds in a year. One hundred and forty pounds of butter in a year per cow. Now, then, that butter at twenty cents a pound will give a gross income of \$28 from a cow a year, to say nothing about the calf or skim-milk, \$28 for her feed. We figure the calf and skim-milk probably would pay for the care she received. Now, I believe that those records also show it costs about that to keep a cow, consequently the farmer has not had anything for his investment, and he has done all that for fun, just for the sake of having something to do.

Those conditions, at that time in Denmark, led up to the formation of this dairy test association. The Danish people are just like the American people, they are not in business just for fun; they have to make some money—there is no great life insurance company in Denmark that they can become directors of and get rich in a short time; they have to work hard for everything they get. If a crop failed, if the oat crop failed, or the wheat crop or anything of that kind failed, you would see any number of farmers go bankrupt and have to leave their farms, so they found they would have to learn whether they had good cows and find some way of distinguishing between the poor cows and the good ones, because they could not afford to keep the poor cows. It costs as much to keep a poor cow as a good one, and they had to have some reliable means of finding the good cow from the poor one.

In this country, at the present time, we have those means at hand. We have the Babcock tester and any dairymen, any farmer could find out for himself the production of his own cows.

As I said, in Denmark the condition was the same ten or fifteen years ago, and the government found out that if a man did not do that for himself, they might, by organizing an association and getting the farmers to club together, they could get that done in a more reliable way and a more systematic way. At that time they did not have Babcock testers. They had other tests, but the apparatus was so expensive the ordinary farmers could not

afford to buy it. It cost something like \$150, and the ordinary farmer could not afford to buy it, and then the first co-operative testing association was organized in a community right around a creamery, and so well did the idea take there, that today Denmark has several hundred testing associations.

I hold in my hand a report of the first dairy test association ever organized, and it gives the result of ten years' work. Eighteen hundred and ninety-five was the first year of the work, and 1905 was the last year, and there is a great deal of valuable information in that little pamphlet. They found, for instance, that in some cases the profits had been increased 100 per cent or more; in a great many herds the profit has been increased fifty per cent, and on an average, in those ten years, the production of butter per cow has been increased from 217 pounds to 255 pounds. That is an increase of thirty-eight pounds of butter in a year per cow. That means over 19,000 pounds of butter have been produced this year over ten years ago. If you figure a pound of butter at twenty cents that means \$3,900 have been received by those farmers over the amount received ten years ago, figuring the cost of butter and the number of cows the same. Now, I think, that is a very good inducement for us to take up something of that kind, because the expense of carrying on that work has been only about \$300 a year, and the gain has been \$3,900 a year. This association has 522 cows now, and I am sure that only half of the farmers of Denmark have taken advantage of all the lessons that have been taught in that work. You can see if all the farmers and dairymen would take advantage of it, that amount might at least be doubled.

It has taken about ten years for the Danish farmer to awaken to the importance of keeping good cows and weeding out the poor ones. He is wide awake now, and I assure you that we can expect good results from Denmark for the next ten years. The work of these dairy test associations in Denmark has been fostered and encouraged by the government.

Now let me explain the work of these associations. If a certain community decides that they can support a cow testing

association, they organize themselves into a society and agree to pay a dollar a cow per year. For this dollar they hire a man, an expert dairyman, whose business it is to go around from farm to farm. He comes to each farm once a month, in the afternoon he sees the feeding done, and weighs the feed. He sees the milking done and weighs the milk and takes a sample thereof for testing. He repeats that performance in the morning. From these figures he estimates how much feed the cow ate for the last month and the cost of the feed, and he finds out how much milk the cow gave last month and how much butter fat there was in the milk. Knowing this and knowing the market price of butter fat, he knows how much the income from every cow was for the last month. Doing this twelve times during the year, he will have a fairly accurate estimate of how much the cow ate, how much it cost to keep her, and how much the cow returns for the money expended on her. He will know how much it cost to produce a pound of butter with every one of his cows, how much it cost to produce a hundred pounds of milk, how much the cow returned for every dollar's worth of feed expended on her, and so on.

Now, you may say that it is not sufficient to test the milk once a month, and yet if you will look up statistics of any experiment station where they have kept daily records of their herd for a year, and from those records pick out every thirtieth day, take the average and multiply that by 365, you will find that you will come very close to the actual figures. They have tried that in Denmark, and in no case were they three hundred pounds of milk out of the way.

I believe there is need of something of that kind in this country. Prof. McKay of Iowa reports that the average production of butter fat per cow in Iowa does not exceed 140 pounds, and from the records we have collected in this state, I am tempted to say that our cows are no better than the cows are in Iowa. I wish to relate a little incident that happened last summer. I went to a creamery and picked out promiscuously the names of fifteen men from their books and found out how much milk and

butter fat those fifteen men had delivered the past year. V... those records I went out to those 15 men and found out... many cows they had kept during the last year and then averaged the income from each cow, and in only one instance was the... come \$25, the rest averaged from \$18 to \$20 per cow per year. Now, if those farmers could feed those cows for twenty dollars a year they must be dandies.

I have a report of the work in the first cow testing association.

The average production per cow has increased in Denmark in a period of nine years almost a thousand pounds of milk, not far from 40 pounds of butter, and that the test has been increased from 3.32 to 3.54, and that in spite of the fact that 30 per cent of the cows in the association aborted or were farrow cows, and in spite of the fact that many of them were affected with tuberculosis.

When we started the first test association in Michigan we were met with some suspicion on the part of the buttermakers in that community. The association was located in a locality from which three creameries drew their patronage, and the buttermakers in those creameries fought the association with all their might. They were afraid that the farmers would be dissatisfied with the test at the factory as the result of the work of the association. They were afraid that the test on the farm and the test at the factory would not agree, but one of the buttermakers told me, after he had seen the association at work one year, that he had not had a single complaint from any of the members of the association, and they had become enthusiastic dairymen in that they understood testing and variations in tests better and had become friends and supporters of the creamery. Those are the things that lead me to believe that we could do no better than organize cow testing associations in every community where there is interest enough to support one, and to the creameries I would say that they can do no better than endeavor to organize one in their respective communities. They will find their patrons will be better satisfied, there will be more milk within easy reach of the factory, and more profit for themselves and their patrons.

Chairman: Are there any questions that you would like to

Mr. Gilkerson: I would like to ask what principle they art on in starting these Associations?

Mr. Rabild: You understand this Association is simply a Farmers' Association owned by the farmers. We have nothing to do with it excepting to help the farmer get a start. We like to work with the state authorities. If you are interested, take it up with your state university.

Mr. Gilkerson: Do you work in connection with the State University?

Mr. Rabild: We help them all we can.

Mr. Gilkerson: I would like to state that I think in the near future we will have in the northern part of Illinois a cow testing association. We already have a few to start with, but it needs a little bit of encouragement. I have been testing my cows in this way for about eight years. I started in with an average production of 185 pounds of butter fat per cow. I find in looking over my records of a year ago that I have an average production of 287 pounds. I am trying to work with my neighbors and every time a University man comes to make a test we have two meetings that week. I have him earn his money. I call in my neighbors and we are in hopes very soon to have a cow testing association in northern Illinois. I am interested to find out the matter of procedure and all I can about this.

Chairman: Any other questions? Do not hesitate about asking questions. We are all here for information. If the question is a simple one it often brings out a good point.

Mr. Reynolds: Why cannot they send a man from Washington to each state?

Mr. Rabild: We do not like to go into a state and take up individual work.

Mr. Sanmann: What would be the easiest way to get the farmers interested in this cow testing association, where they know nothing about testing?

Mr. Rabild: The way to do is to go with a member of the association to this man. I have been in localities where apparently there was no interest; staid two or three days and succeeded before leaving in forming an association. All that is necessary is to have cows enough.

Mr. Sanmann: Would there be any danger of getting too many cows in a herd, so one man could not handle them, say sixty or seventy?

Mr. Rabild: We have some sixty cow herds. A man spends two days then.

Mr. Gilkerson: How do you equalize the pay?

Mr. Rabild: When you come to figure on this co-operative spirit it is easy enough. On the other hand the cow tester gets his board and lodging where he does the work. It averages one day a month. It is less sixty cows per man than ten cows on an average.

QUALITY IN DAIRYING

by

H. R. Wright, State Dairy and Food Commissioner, Des Moines, Iowa.

Chairman: This discussion has been very interesting; something we need in this state more than anything else is Cow Testing Associations. We are grateful that Mr. Rabild has come and talked to us.

We will take up the next number on the program. Honorable H. R. Wright, State Dairy and Food Commissioner of Iowa will now talk to us. I take great pleasure in introducing Mr. Wright.

Mr. Wright: Mr. Chairman: I suppose that everybody knows that Iowa is a great dairy state, but not in the same sense that Illinois is a great dairy state. We have no large cities to be supplied with milk and cream; we have only three condensed milk factories; our dairy business is the production and manufacture of butter. We have a large number of creameries and in them make a very considerable amount of butter. However, there is one thing that is an absolute essential in all kinds of dairying, that is quality.

There are some good qualities and some bad ones, but I suppose I am expected to talk about the good ones.

The man who begins the dairy business expecting to succeed must have some peculiar qualities of persistence; he must be ambitious to better himself; he must be energetic, but he must not imagine he can do business on a wholesale scale. His energy must be of the persistent kind, rather than the violent kind. His ability and willingness to attend to details must be great. The dairy business is one that requires the presence of the boss at all times, and the man who expects to succeed by sitting in the house and telling the hired man how to work, or who expects to be on the job himself one or two days a week, will be doomed to disappointment.

We have a good many men in Iowa who are trying to get rich by milking cows that look well and are sort of sociable, but that don't give much milk. Taken as a whole our dairymen are prosperous, but we have too many cows of poor quality. The cow must be of the right kind if we expect to succeed in the greatest degree. When our lands were worth ten or twelve dollars an acre, and feedstuffs and farm help were cheap, we made considerable profits, but conditions have very much changed and we are urging our people to get cows of a different character and capacity to produce, that is of better quality for dairy purposes.

We hear nowadays a good deal about the quality of milk and cream. There are a few simple things that are everywhere true about any milk product; one is that milk never gets any better, no matter what attention is given to it. Deterioration is constant and the most we can do is to retard it. We have too many people at home who give too little attention to the sanitary conditions under which the milk is produced and handled, and so the quality is not so good as it might be. Care and cleanliness is about all there is to the quality of milk and the right place to begin is at home when the milk comes from the cow. We cannot improve upon what the cow gives us but we can "better" the quality of the milk or other dairy product that goes upon the market by producing better and cleaner milk than heretofore, whether the product sold be milk, cream or butter.

With us, the quality of our product has at least not been made better by the introduction of the hand separator. There are 85,000 of them in the hands of Iowa creamery patrons, and they are useful and economical in most senses, but we have had to do a lot of work to induce the farmers to use them properly and produce that high quality of cream that means the most money for the producer. Indeed it is not too much to say that the quality and quantity of dairy products depend upon the kind of a man the dairyman is.

Most of us are in the dairy business for the money there is in it and we shall hardly hope to induce farmers to improve the

quality of their products unless it can be shown that there is more money in it than in the old way. I believe that whether a man produces milk or cream or butter he will, in the long run, be paid for it on the basis of the quality of it. When the product at last gets to the consumer its price depends almost wholly upon its quality, and there is no reason why the producer of the high quality goods should not get recompense in proportion, and almost always he does. For instance, it has long been a fashion to pay five cents a quart for milk, and people think that any higher price is a high and undesirable one. But every one knows that those milk dealers who are producing a high quality of milk are not only getting the high price but that they get it easily. The people who pay ten cents or more a quart are not the people who do the kicking. They demand and get high class milk and are willing to pay for it. The people who want the best are never fully supplied and hence the demand is always present and the market for that kind of goods is always present and sure. That's a thing that exists in all lines of business. If you put up a dozen horses for sale, the first one sold will be the best one and the last one to go is the poor one.

If there is any product of the farm that is actually sold all the time on its merits, that product is butter. In the butter houses in New York, when a buyer comes in looking for butter, he tastes of it and if it doesn't suit him, he goes on to a better grade and when he finds the best he asks the price. He doesn't care what the price of the poor stuff is. There is never any trouble to sell good butter. The poor butter must seek a buyer, not only at a low price, but its sale is slower and more uncertain. People will not pay a high price and suffer in the quality of the goods they receive. So that an improvement in the quality of butter means a higher net return and a quicker sale.

There is another reason. We visited the St. Louis market this morning and every merchant there had oleomargarine for sale. It was labeled "Fox River Dairy," "Wisconsin Creamery" and "Elgin," but not a pound of it was butter. The price was about twenty-six to thirty cents a pound. Now it has always seemed to me that oleomargarine does not compete with butter,

that is good butter. But when good butter does not exist in sufficient quantity to supply the demand for butter, then the buyer is offered on one hand a pound of poor, stale, rancid butter, and on the other hand a pound of oleomargarine, which has little taste or flavor and he takes the oleomargarine. If on the other hand one has a dozen carloads of high class butter he can sell it at a good price before supper time today, because it is scarce and in demand in all the butter markets of the country. I tell you that poor butter is the best friend oleomargarine has because it is easy competition. If we increase the quantity of high quality butter and decrease the quantity of low quality goods we shall in a large measure solve the oleo question.

It takes brains to make quality whether in butter or any other product. A number of years ago the farmers in Iowa thought that three times ploughing their corn was enough. Then somebody suggested that a fourth ploughing would be profitable and our farmers quickly and willingly followed that teaching. Then they have lately been taught to select their seed corn in the fall, and along about Christmas they are all willing to concede that they ought to have done so, but they didn't. The head work is not so attractive to them, but the fellow that works with his head and his hands is about fifty per cent ahead of the fellow who will only work with his hands. The improvement in quality whether it is the quality of our cows, or of their product, comes by reason of mental energy devoted to selection of the cows and to the care of their product.

HEALTH OF DAIRY CATTLE

by

Dr. Jas. B. Wright, State Veterinarian, Chicago, Ill.

Chairman: Are there any questions that you would like to ask Mr. Wright. I am sure his talk has been interesting. We are all very grateful to you, Mr. Wright.

The State Veterinarian doesn't think we are a dairy crowd. We are very fortunate today in having with us Dr. Wright. He will talk to us a while, and I hope he will tell us what we ought to do. After the scolding, if he sees fit to scold us, we are willing, for I feel we have been very negligent in enforcing the laws. Illinois has been up against the proposition of receiving the cows Wisconsin and other states did not want. We have been buying them and putting them on the farms. I do not believe that it is right. I do not know if he is going to talk about that, but I hope he will.

Dr. Wright, will you take the floor?

Dr. Wright: Mr. President, Ladies and Gentlemen: Your Chairman said he did not know what I was going to talk about, neither do I.

When I took up the program yesterday after returning from a week's work at the Institute, I saw that I was asked to talk to you about the health of the dairy cow. I do not want to speak about her health only in part, it is the other one that I want to speak about.

One year ago about this time, in another city, I was invited to talk on the subject of tuberculosis, and I will have something to say about that question today before I leave the floor. I thought, perhaps after I had finished the hour at that time, that it would be the last time the Illinois State Dairymen's Association would ever want to see me again, but evidently not.

There are several principles underlying the work which we are pursuing. We have to study the nature of an animal before we attempt to arrive at the methods to pursue. When we come to live stock and domestic animals one thinks about the class he likes the best. I remember hearing a discussion one day: One man said he liked a dog best because a dog would adapt himself to the peculiarities of his master; another said a cow, because she supplies the food for the family. Josh Billings was asked his opinion as regards a dog. He stopped and thought a minute and then he said: "If you should take up a poor starving dog, and take him home and treat him well, and start him on the road to prosperity, he would never bite you, but a man would." So in some respects a dog is superior to man. The dairy cow, if she is healthy, is one of the greatest aids to mankind. She comes as near being a member of the family as is possible to be. From the products of that cow, the babes are fed, the older ones are fed to a certain degree; she supplies almost a perfect food. Is it not essential that she should be in a perfect state of health? This question is important; it depends upon the condition of the cow, whether your children will live to a good ripe old age. That is what it means; stop and think of your own family. I don't care how much butter fat she has or don't have, if it is pure.

That leads us again to the question: What diseases may the cow transmit to mankind? 1st, Diseases that may be transmitted in her products and she not subject to them, as Scarlet Fever, Typhoid Fever, and diseases of the cow that may be transmitted to the human race. Example, Tuberculosis, Anthrax Foot and Mouth diseases and others. This being true it is our duty to be vigilant in the care and in protecting the cow from all evil influences and disease. By doing so we protect our children from disease and death. A cow should have good clean surroundings, plenty of pure air, plenty of good clean and nourishing food, and above all good pure water to drink.

I have just returned from a city situated on the banks of a river where Typhoid Fever has been an epidemic. The water supply of the city was and is taken from the river a little above the city. The sewerage of the city empties into the river below

this point. The analysis of the water which supplies the city was shown to be free from the germs of the disease in question, but the milk from a dairy herd located below the city and obtaining its water supply from the river, was found to contain large numbers of the Typhoid Fever germs. The germ of this disease will live for at least 30 days in impure water and milk and is a splendid medium for it and when once introduced into milk they will increase rapidly in number.

There are others. There is one which I have been battling with for a long time, and I expect to battle with it until my eyes are closed forever. That is the White Plague. Perhaps it will be well for me to give you a few statistics and then look for reasons. Now, I will quote you first what the Metropolitan Life Insurance Co. of New York say. They say this, that one-third of our deaths which occur between fifteen and forty-five die from Tuberculosis; one-third from twenty to fifty die from Tuberculosis; one-half between twenty and thirty-five are due to Tuberculosis, and I firmly believe that they are telling the truth.

During the Civil War which lasted four years there were 205,070 deaths from all causes and we are appalled at the fact. There must be a calamity to make the human mind realize the danger at their feet. In one of our counties in November 300 lives were put out in short order by a catastrophe; it stirred every one even beyond the limits of Illinois, yet during that same month there were at least 700 people who died in Illinois from Tuberculosis. Do you hear any one hollering about that?

There is no chance of stamping the disease out as long as the source remains. There are 300,000 animals in my judgment in Illinois that have the disease. Now then this disease, as I have indicated before, which is the most dreaded is, that form known as bovine Tuberculosis, which is transmittable to the human. Now what is to be done to stop the ravages of this disease? As an official, I cannot answer the question, but I can as a private veterinarian, and I will answer the question, I will draw your attention to some of the facts. They cannot suppress or control me as long as a warm drop of blood is in my body. Some of you gentlemen are versed in other lines of science; you know if you

take any little plant, and you take the seeds from that plant, and after a few generations, it is a different product under different conditions. The germ of Tuberculosis is the same everywhere, changed in character and virulence by environment.

The germ in the monkey is similar in appearance to the germ found in the human. Now if the germ as found in the monkey, should be introduced into the body of an animal of the feline specie, you would find in the course of time, that it would be so changed you would scarcely recognize it, it would be very much larger. If you should replant these large germs into the monkey, they would soon return back to their original form and size.

The enemies of our teachings will tell you that the germ of Tuberculosis is different in the cow and that it cannot be transmitted to the human. All such questions are raised for the expressed purpose of defeating any progress being made in the eradication of the disease, all to attain their selfish ends. The question has resolved into this: Selfishness and greed is pitted against the sacredness of human life.

If you killed every person who had that disease and people continued to consume the milk products without doing anything to eradicate bovine Tuberculosis, in a few generations we would have it just as bad as ever. It cannot develop and progress in the animal body where it is leading a natural life. Take men for instance who are breaking down with the disease, take them off for a few months into the country where they have pure air and sunshine and good food and they will get apparently well. Now that which will cure will certainly prevent. You will say we are able to produce more milk and cream if we keep our cows housed even if they should contract Tuberculosis. Would you not rather have a herd that was absolutely free from the disease and not producing so much, than to have one which has Tuberculosis and producing more milk?

In some sections of the state, the cows are put into barns poorly ventilated and they have poor sanitation in general, and are not taken outside once a week. The whole secret is we are getting too far from nature. I do not mean that we should ex-

pose ourselves to the extreme conditions, but we should get plenty of outdoor life. You might ask me what kind of a barn I would suggest. I do not know. A gentleman who came to me recently said he had been through all that. He said: "I paid well for it, too. I live in the northwestern part of the state. A few years ago I discovered the disease in my herd. I turned the rest out to pasture. More than a year had passed when I noticed I had some fine animals. I decided then I would give them another Tuberculin test, which was done and none re-acted. I will tell you what I have done. I have built the sheds where they can go out of a storm, and you will be surprised how little they go there for protection, and there is not a single one diseased." To prove that proposition, I know this is new to some of you. We have in Lincoln Park monkeys, we get them from hot climates, and we tried to keep them warm and used every possible means we could for their comfort; every one of them would die with Tuberculosis within fifteen months. Finally I got discouraged and said I am going to put them out in a pen. Some of the Directors criticized me. They said: "You will kill every one." I said it would be better to kill them than to have them die with that horrid disease. The result is, we have monkeys that have been there seven years and in perfect health. That teaches us the same principle, and it is the one that is being taught all over the world, to keep people in good health.

I am going to call your attention to something else, there are over thirty states in the union where they will not accept dairy cows unless they are accompanied with a certificate showing they have successfully passed the tuberculin test. Minnesota and other states are shipping cows that are diseased into our state because we have an open market. For that reason our live stock is imperiled beyond what you expect. If this practice is continued the disease will be driven into every herd. They are even having public auctions and selling those cattle as tuberculin tested cattle. If they think you will have them tested, they will inject them before the sale, for they will not respond again for thirty days. I know whereof I talk. I have seen hundreds of instances like this. One of our institutions bought twenty cows

some few months ago; a short time afterwards they found eighteen diseased and examination showed that they had been diseased a long time. Two years ago, I found 122 diseased animals in a dairy herd of 156.

If you are starting a dairy for God's sake and for your own sake do not permit your herds to have the scourge; have them properly tested beforehand. Another thing, do not take any one's word, but be sure to use the Government tuberculin when making the test. I have had my own battles to fight along these lines. I will not consent to give a certificate of health unless the test is made with the Government tuberculin, for that is reliable and the other is not, but what is more unreliable is mankind. You can hire all the men you want to make the test, and you will find very few know how to make the tuberculin test or do it honestly. I know this well. The city of Chicago said one year ago that it was going to accept the certificates of health from all veterinarians, I said: "If you do, you may as well not test at all, for you will do more harm than good. You will drive the diseased animals into the healthy herds, if you do not do something with the diseased animals."

Last September the Health Commissioner of the City of Chicago came to me and said, the conditions are such that our work is not reliable. If you will pass on all health certificates we will not recognize others. I said that I could not accept. I said to the Commissioners, I'll tell you what I will do, I will appoint men whom I feel that I can trust and have them conduct the test according to my method, and any one who does not want to do it that way I will discharge him. One man I had to discharge the second job he did. In order to have control I advised this plan to prevent any crookedness. It was agreed that every animal that passed the Tuberculin test should receive a health certificate which would be good anywhere in the world, even if it did not have an official stamp. The next thing that I wanted was to have every veterinarian brand the letter "T" on every animal that showed any signs of Tuberculosis. It does not hurt the animal but puts the mark of Cain on it. You would be sur-

prised at the comment this action caused, and finally we went to the Attorney General and the Attorney General ruled that as State Veterinarian we could do nothing of the kind; but if I acted as a private veterinary he had no opinion to express, but he will have to express a good many before I quit it. A few days ago another city came to me and said: "We want pure butter and cream; we do not feel that we have been having it, can you do for us what you have done for Dr. Evans?" I said: "I can and will." Now to show you that I am not doing this for gain, I do not receive one cent for this work from any source. It costs me for postage, telephoning, telegraphing, etc., a large amount every month. I hope it will not continue at that rate. But I have felt like this: I have commenced this work, I do not expect to accomplish much, but I want to feel that I have done enough so that the next man may work more easily. I feel that the future longevity of the human race will be increased, and the dairy cow will be free to a large extent from disease.

I hope to bring Illinois up to the level of other states. I hope to live to see the day when Illinois may be a shining star to other states.

Chairman: Are there any questions that you would like to ask?

Member: When can you tell that an animal has tuberculosis?

Dr. Wright: You cannot tell until they reach an advanced stage. The only way to tell is by the tuberculin test, and it does not injure in any way if the animals are free from tuberculosis. It is infallible.

Mr. Newman: If this resolution was out of the way is there a law?

Dr. Wright: We could by a proclamation from the Government put up the fences. It is improper for me, or any per-

son acting officially to say anything about the tuberculin test; but I will as a private veterinarian. They can take my commission away if they wish to. I believe if the people of Illinois thoroughly understood that there is necessity of making a fight they would do so, for I have great confidence in the majority. You should have public gatherings as much as possible. You should have addresses at Farmers' Institutes, then get the bulletins from all the principal cities in the world. They are sent to you free constantly so that you can post yourselves as much as possible. In that way I think there is a great deal of good being done.

If there is anyone who would like to receive literature, all you have to do is to send your name to the State Board.

Member: How about cows reacting?

Dr. Wright: After I have tested several hundred head I find that it made no difference.

Member: Does not the time of the year make a difference about the reacting?

Dr. Wright: No.

Mr. Jansen: If the tuberculin test is properly applied, is it certain as a post mortem?

Dr. Wright: I believe if you would give me 100,000 cows to test, I am satisfied they would show 98 per cent, and the other 2 per cent you could find from laboratory work. I am glad you asked the question.

Mr. Jansen: Then you can make a reliable test?

Dr. Wright: Yes, of course it takes an experienced person. He will take all those which are the worse, he don't take them because they do not show that rise of temperature, if he is an experienced man he will be able to tell. The cow's temperature is peculiar, the slightest thing will cause that temperature to jump either up or down. I do not think any one should use

milk unless he thinks it is free from disease. We in the city cannot help ourselves. For twenty years no milk has been put on my table that has not been boiled. People say that by pasteurizing milk it will free it from disease. I do not believe that. Milk heated to 156 degrees will not destroy the flavor but 157 degrees will.

Now there is a gentleman that I visited that had Guernsey cows and he supplied that milk through his own plant in Chicago. This milk is sold at fifteen cents, general commercial milk is sold as low as 8 cents. I do not buy that 15 cent milk because I am not satisfied yet.

A gentleman came to me at Pontiac, he said his home was in Indiana. He said: "I am contemplating establishing a large dairy farm and intend to be governed by the rules of the Department of Health." I said: "If you conduct it right and stick to it, you will make good. If you establish that farm and agree not to put anything on that farm that I have not tested, I will give you a certificate of health and you can sell all of your milk for 15 cents." The time is ripe now in Chicago for some one to make a fortune out of that. I know that to be true. Any further questions?

Mr. Sanmann, You say it would be safe after a veterinary has passed upon them, we can rely upon every veterinary!

Dr. Wright: In my profession of course there are a certain percentage that are not reliable, the same as in any other among the rank and file; the veterinaries are no exception.

Chairman: The question of experience comes in strongly.

Dr. Wright: Any further questions? If not, I will thank you again.

Chairman: Before there are any other questions, Mr. Cummings would like to speak to you just a moment.

Mr. Cummings: The Association wishes me to announce, gentlemen, that tomorrow night will be the banquet given by

the Vandalia Business League in honor of the Association, and we hope that all of you will remain over who can and break bread with us.

Chairman: If there are no further questions we will stand adjourned.

Thursday Morning, January 20.

CLEAN DAIRY PRODUCTS

by

J. B. Newman, Assistant State Food Commissioner, Elgin, Ill.

Chairman: I take pleasure in introducing Mr. Newman. We all will give Mr. Newman our hearty support, I want you to give him all the support you can. We feel that when men like Mr. Newman are at the head of a Food Department, our interests will be looked after. I take pleasure in introducing Mr. Newman.

Mr. Newman: I have been requested to prepare a paper on sanitary dairying and sanitary dairy products. First let me call the attention of you gentlemen to the fact that you are handling a food product; a food product that nourishes four-fifths of the babies of the country, a product that is used in some form by all families, the old as well as the young, the poor as well as the rich; not only the sick but the healthy. This food constitutes 16 per cent of all the food used by the average American. The cheapest food, the food that has no substitute—PURE MILK.

Remember at all times that you are handling a food product, a food product that is consumed raw, not one that is protected with a shell or with leaves nor one that comes in a bottle or in a can. It is exposed in its early stages until it is bottled for delivery, and when you appreciate the fact that you are handling this great food product and handling it in this exposed condition, you will appreciate the importance in connection herewith, all the laws of sanitation. The problem of providing

clean, wholesome milk for the ninety million people of this country has the attention of the physician, the chemist, the bacteriologist, the veterinarian, the dairyman and the sanitarian. The entire civilized world is participating in the fight against unnecessary insanitary conditions, unnecessary sickness and unnecessary and shameful loss of life resulting from insanitary conditions. I want to call your attention to these unnecessary insanitary conditions as they apply to impure milk. It is one that must be considered carefully for the financial investment in this milk industry is one that is enormous, yet little appreciated. According to the last census there was shown to be sixteen million cows in this industry with a given value of five hundred million dollars. The products from the same in butter, milk and cheese equivalent to another five hundred million, or one billion dollars for the cattle and their products, and it was estimated that the land, buildings and equipment represented in this industry was several billion, and it is expected that the new census about to be taken will show an investment of about ten billion dollars in this industry alone. So you can readily see that any unwise changes or unnecessary changes are to disturb enormous values, and if unwisely done might cause enormous unnecessary loss. But the necessary changes for the proper sanitation in this industry can be brought about with but little unnecessary expenditure, and as these changes have been discussed for a decade by the most competent men in the Federal Department (whom I am going to quote from time to time in this paper) and the State Department before making recommendations, you are assured that those changes which they have in the last decade recommended are those which have been acted upon only after the most careful consideration of the subject from all angles. Observe a few simple rules and regulations for the handling of milk and a little extra labor and added expense. General conditions being the same, the community having the best milk has by far the lowest death rate. One city in our community reduced the death rate of children, from all causes, from thirty-three to fifteen per cent, the diminuation beginning immediately upon the improvement of the milk supply. The city

of Copenhagen, Denmark, reduced its death rate from the highest in Europe to the lowest; by simply purifying the milk supply. We can hardly exaggerate the value of pure milk and every citizen should assume his proper amount of responsibility in the matter.

THE DAIRY FARMER OF THE FUTURE MUST MAKE HIS PRODUCT SO WHOLESOME, QUALITY AND CONDITIONS SO ATTRACTIVE AS TO DEFY COMPETITION. The consumption of milk and cream is increasing at a rapid rate in our cities and towns. In 1900 one-third of all the milk consumed was consumed as milk and cream, or an average of one quart per family a day. In 1903 it had increased to one and one-half quarts per family per day; in 1909 it is estimated to have reached at least two and one-half quarts per day per family, which shows that the efforts along the line of sanitation is being appreciated, that the better condition and the cleaner flavor resulting from these sanitary efforts are largely the cause of the increased consumption. Increased consumption necessarily means an increased demand and the direct benefit back to the dairyman. From this increased demand will show itself in an increased return for this more wholesome milk and just as quick as the dairyman can be convinced that extra pains and efforts on his part are going to more than pay for itself by increased returns, the more readily will he observe and follow all suggestions along this line of sanitary production. The demand is practically unlimited, depending only on the ability of the dairyman to produce a clean and palatable article, *and it is only right and proper that milk intended for human consumption should be so produced.*

It is our privilege and duty to demand such legislation as will protect our just rights but we, as dairymen, should make every effort that care, science and skill can make to improve our dairy products and place them on the market in a wholesome and attractive form. Our products have often been carelessly produced; fraud and deception have been practiced to such an extent that the consumer often lost confidence. Convince the consuming public of our cities by the quality of the milk itself that

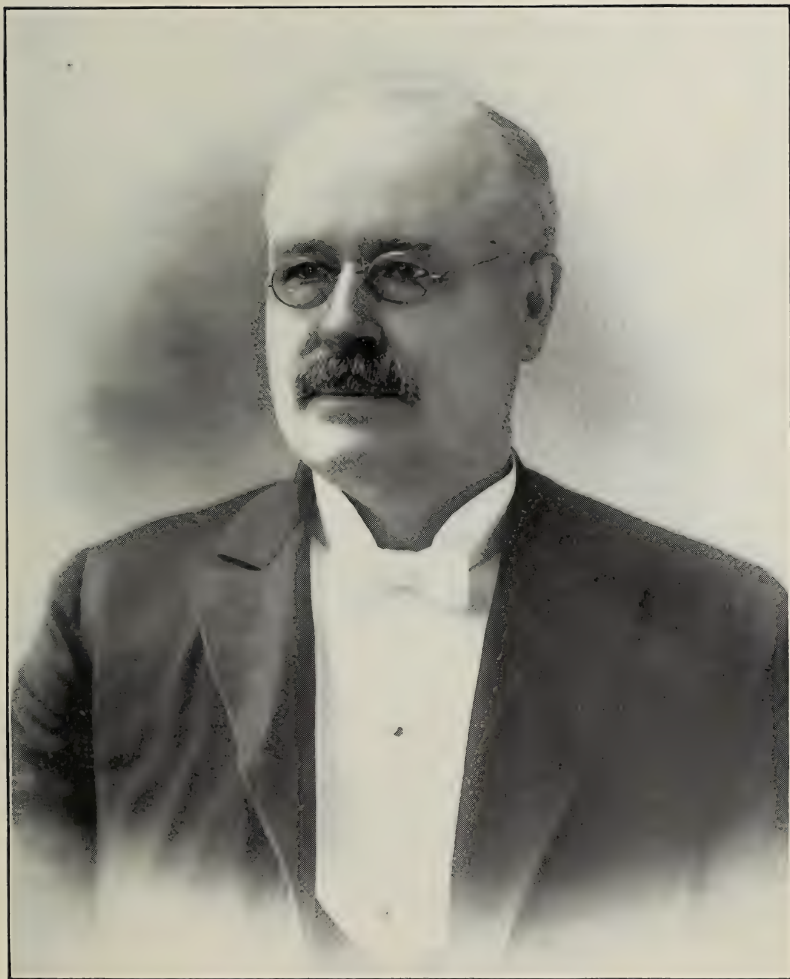
it is honestly and carefully handled from the cow to the consumer's table, confidence will be restored and the consumer will pay you for the necessary increased cost of providing him with a clean and more sanitary product. There are some simple rules for handling milk that require a little extra labor, with no expense, that will add to the keeping quality of the milk produced. And when you add to the keeping quality of the milk produced, you take away from the dealer that argument that he uses when he cuts the buying price, that he has to cut the price because so much of the milk sours on him before he gets it to the consumer.

Bacteria.

Besides the chemical compounds, milk also contains large numbers of minute organisms called bacteria. Few, if any, are normally present in the milk within the udder of clean, healthy cows, but they are so abundant everywhere in the air, especially about the stable and barnyard, and cling in such numbers to the bodies of the cows that they are always found in milk as soon as it leaves the udders or even just inside the teats.

They reproduce very rapidly in a favorable medium, such as warm milk, so that the number present becomes very large unless measures are taken to hinder their increase. The amount in milk of a given age varies with the conditions. That from clean cows, with freshly washed udders, milked into well scalded pails, in a clean place, free from air currents, by persons with clean hands and clothes, and quickly cooled and carefully handled, may contain a few, while milk from ill-kept animals, untidily handled in a dirty place, may contain enormous quantities. Since, as we will show later, bacteria cause the spoiling of milk, and may be harmful in other ways. It is very evident that scrupulous cleanliness about everything which comes in contact with the milk is of first importance.

The excessive number of certain bacteria in milk are the cause of the high death rate among children, while the specific germs when present are the cause of infectious diseases, and in many instances have caused severe epidemics of Typhoid Fever,



DR. J. M. WRIGHT,
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Scarlet Fever and Diphtheria. On account of milk carrying these germs, it must be guarded by strict supervision and impartial enforcement of laws. Sanitarians everywhere, the public generally and dairymen in large numbers are awakening to the necessity of the proper protection of the public from unclean, impure milk.

A great many kinds of bacteria have been found in milk, each of which occasion a special set of changes as it develops, the most important kinds are those that cause the ordinary souring of milk and are the first to produce any noticeable change in the taste and odor. In their growth they feed upon the milk sugar, convert it into Lactic Acid which gives slightly sour milk its peculiar taste and odor. Other bacteria develop in sour milk and give it a strong unpleasant odor and flavor. Some of the products of bacterial action on milk are desirable—for instance those which give butter and cheese their characteristic flavor and odor. Other bacteria in milk color it slightly and others cause aropy and stringy consistency. Filthy conditions aid the growth of these undesirable bacteria.

Flavor.

The flavor of milk varies almost as much as its composition. It is, in part due to the amount of fat present, but also to the bacterial action. Flavor is often influenced by the food of the cow. That is especially noticeable when the cows have eaten some strong tasting substance such as turnip, and is due to the fact that the flavor of the food passes directly through the animal tissues into the milk. Milk absorbs flavors and odors from the air more quickly than other foods. The animal or cowy taste and smell which is often noticeable in new milk is believed to be due to this absorption. It may also be due in part from stable dirt which accidentally falls into the milk. The cow may, through some pathological condition, produce milk with an off flavor. A pan of milk kept in a closed ice box with fish or highly flavored fruit is very likely to take a flavor from them. Milk

should always be kept where the air is free from any contaminating odors. Illustrative of the effective flavor, I am going to repeat a statement that I heard ex-Governor Hord make last fall. At the National Convention of the Association of Veterinarians of the United States and Canada held in Chicago, I noticed on the program for one evening that ex-Governor Hord was going to give a talk. I attended the session that evening and Governor Hord in his remarks, related this instance. He said that a doctor at Fort Atkinson where he lives, came to him one day and said: "Governor, I want to get some milk from your herd for a child patient of mine who is starving. We have tried everything on the child and she will either not take it or retain it." The Governor said, "You can certainly have the milk, but it is just pure, sanitary milk." The Doctor said he would like to try it. Well, they got some of this milk from the Governor's herd, and the nurse when she came to feed it to the baby, covered over most of the opening of the cup so that the baby could not see what was being given to it, getting around any prejudice that the baby might have formed. The baby took to the milk, ran its little tongue out and licked its lips and then drank the half cupful of milk, and went to sleep. When it awakened, they gave it some more. The baby thrived on this milk and recovered. The Governor said he could not quite understand how that was until during last summer, he got hold of a book written by some gentleman in Europe, a large volume of several hundred pages, given over entirely to the flavor on digestion. After reading the book, he knew why the baby thrived on that milk. That milk was clean and perfectly flavored and it was probably the only food up to that time that had been given to it that was satisfactory in flavor from the child's viewpoint.

Let us illustrate in another way: you think of something or see something to eat that you like, your mouth immediately begins to water. Now, that watering of the mouth is the secretion of saliva and at the same time in the stomach is going on a secretion of digestive juices and the stomach is getting ready to digest this food before you put it into your mouth, showing

the effect of the digestive flavor of that article from your viewpoint. Something is set before you that you do not like, you may eat it as a matter of politeness or because you feel that you have to eat something, but you do not relish it and your digestive organs do not digest it as they would an article that you like.

Dirt in Milk.

There is frequently more dirt in freshly drawn milk, most of it fine particles of litter and manure which falls into the pails from the body of the cow. Milk should be strained at once, or better still milked into pails covered with straining cloths, but even with these precautions, some dirt may be present. Of course, the amount varies with the cow and its surroundings. Under ideal dairy conditions only very small quantities are found, while milk from untidy establishments may contain enough in a quart to form a noticeable sediment. Milk with enough dirt to be visible indicates an untidy dairy and should not be tolerated for it should be remembered that the visible dirt does not tell the whole story as some of the manure dissolves and that is no longer visible.

Milk As the Possible Carrier of Disease.

Disease germs may get into the milk either directly from a diseased cow or indirectly from an infected person, from polluted water, or in some similar way. The most dreaded disease which may come from cows is tuberculosis. It is certain the germ which causes the disease, does sometimes exist in the milk from tuberculosis animals; whether or not persons who drink such milk may become infected by it is extremely hard to prove. There are many other possible sources of contagion, and the disease develops so slowly that by the time it is recognized, it is usually too late to trace the cause. Nevertheless, there is quite enough evidence that the disease may be carried in this way to make the use of milk from tuberculosis cows too dangerous to

be tolerated, even when the animals are only slightly diseased. Among the contagious diseases to which cows are not liable, but which may be spread by milk, the most common are perhaps scarlet fever, typhoid fever and diphtheria, also measles, small-pox and chickenpox. Statistics show that milk is often the cause of an epidemic of such contagious diseases, and not infrequently a serious epidemic may be traced from a single farm.

Last fall at Elgin, several typhoid fever cases had been reported to the Health Officer and in his investigation he found that several of them were patrons of the same milk man. He went to the milk dealer's place and found that his wife was just recovering from a case of typhoid fever. Of course, they stopped his entire route at once. They further investigated and found that the water from his well was full of typhoid germs. That was where his wife had gotten it and between her handling the utensils and washing them with the water from this contaminated well, the milk was contaminated. The bacteria causing these diseases frequently get into milk from contaminated water or from persons who have been exposed to the disease and who handle the milk. For this reason no water which is not above suspicion should be used around the dairy or anywhere else, for either drinking or washing, and no person who has been exposed to such disease should be around the cow, the milk or the milk utensils.

Last month Mr. Sam Shilling and myself made addresses at some dairymen's meetings in Southern Illinois and while at Highland, Illinois, I had the pleasure of meeting Prof. Patrick, formerly of the University at Ames, Iowa, and for some years past connected with the Bureau of Chemistry of the Bureau of Agriculture. Mr. Patrick was at Highland attending to some investigations for his department. We rode into East St. Louis together and he related to me an incident that will illustrate what we have been talking about. A year or so ago, an epidemic of typhoid fever occurred in Georgetown, a suburb of Washington, D. C. Investigation by the authorities showed that most of these cases were on the route of one milk peddler. They traced back to this peddler's place and no one was affected there

and the water seemed to be all right so they examined the milk as it was delivered to him by the farmer he was getting his supply from, and they found the milk from one of these farmers laden with the typhoid bacteria. They went to this farm and everybody seemed well. It was run by a widow lady and her children. The children said no one had typhoid fever and this was true as far as they remembered. In speaking to the mother about it she said she had had typhoid fever about eighteen years before. They made a careful examination of her and found one of those rare cases, but not the first one, where the human being, after apparently getting over the typhoid fever was still a regular incubator for the typhoid germ and they kept developing and multiplying in her system, and she was contaminating the milk. When I related this circumstance to our Health Officer in Elgin, when I got through, he stated that the previous summer, at the Convention of Municipal Health Officials this same case had been referred to by one of the officials at Washington, D. C., and they at this convention, further referred to a celebrated case in New York City of a woman effected this way. She was called "Typhoid Mary." She was taken up and placed in one of the hospitals to see if they could not drive this hot bed of bacteria out of her, and just last week, I read in a New York news item that "Typhoid Mary," after three years in a New York hospital, had been pronounced free from the germ and released. Dust from the sputum of diseased workmen in a carelessly conducted stable was carried by a draught of air in the milk and a year or so later a child dies of intestinal tuberculosis. The cause and effect are widely separated from point of time and sometimes distance, but the result is as direct and logical as the assassin's deadly bullet.

An example is given in one of the Government Bulletins of a test made on milk of twelve cows in the same stable. The milk from eleven of the cows showed a small bacteria count but the milk from the twelfth cow showed a count of one hundred thousand bacteria per centimeter. Investigation showed that the twelfth cow stood next to a pile of ground feed, that every time

the feed was disturbed or the wind struck it, the bacteria in this feed, of course, was blown about, and she being nearest to it, at milking time, when the feed was generally distributed and they got into the milk. This was given as an explanation of the greater bacteria count in milk from this cow over the other milk.

Preserving Milk.

If milk could be obtained and kept free from bacteria it would probably remain sweet almost indefinitely. How near to this ideal it is possible to come may be seen from the fact that milk from several American dairies exhibited at the Paris Exposition in 1900 was sweet when over two weeks old, no method of preservation being followed except cleanliness and keeping it at a temperature of 40 to 42 degrees F. According to a more recent data, published by the Bureau of Animal Industry of the Department of Agriculture, clean milk may be kept five to seven weeks.* The conditions which make such milk possible are still uncommon, but they are becoming and will continue to become more common as consumers realize that it is worth the extra cost which the necessary carefulness entails.

The Cow.

Commencing with the cow, the first thing that attracts attention is her outward appearance, her condition of flesh, the condition of her hair, her breathing, the look in her eye, the udder and teats very carefully examined. The comfort of the cow next calls for attention. The bedding, temperature of the stable, the barnyard, the number of cubic feet of air space per cow, and the character of the feed and water should be carefully looked into. Last and by no means the least important feature in connection with the cow is her cleanliness, as a cow cannot furnish clean milk when her udder, flanks and tail are caked with manure. The clipping of long hairs from the cow's udder, flank

*U. S. Dept. Agr. Anim. Indus. Circ. 117.

and tail, recommends itself to you all. It costs the dairyman little or nothing, makes his work of cleaning the udder much easier, and is of great help in producing a cleaner milk.

Regarding the Stable.

The first thing that attracts the observer's attention is its location relative to the other buildings, its drainage, and the drainage and cleanliness of the stable yard. The disposal of the manure next receives attention. It is hauled daily to the field, kept in a proper pit, or allowed to rot on the boards on the sides of the barn. Entering the stable, the general construction is considered; has it a tight floor, a gutter, stanchions, low mangers, smooth, tight ceiling, and smooth, tight walls? What is the number of square feet of glass per cow and the method of ventilation? While you are noting the equipment, the cleanliness or dirtiness of the stable is always before you. Too often, through the country we find loose ceilings. By that I mean saplings run through the stable with straw or hay piled on top to make the ceiling. Such places invariably have the ceilings and walls covered with dust and cobwebs, and some of this dust and dirt finds its way into the milk. Most dairymen agree that cobwebs are a bad thing in a dairy stable although one man argues that they keep down flies and he would be very sorry to part with his cobwebs. The keeping of horses, pigs or poultry in the cow stable is also very objectionable.

Fresh air is necessary to the health of the stock. So, too, is light. It is well known that sun light will destroy germ life. The dairyman while providing proper ventilation should also provide for admitting an abundance of sunlight into his barn. Fresh air and plenty of sunlight are the surest means of preventing germ diseases in the dairy herd. Should whitewash and have screens on windows.

Right here I want to illustrate the action of air and sunshine on bacteria. Two years ago last summer I was one of a party of Aldermen from the City of Elgin that went to Ft. Leaven-

worth, Kansas, to investigate some septic tanks that the Government had installed there at their Army Post, the City of Elgin being right up to the point where they are investigating ways and means of disposing of the city sewerage. Septic tanks were recommended and before going to investigate any we found out that the Government Army Post had one at Ft. Leavenworth, and as you know the Government is very careful before it pays for an article to see that it comes up to specifications and that it actually does what it was guaranteed to do. We were told that an army engineer had watched the operation of these tanks at this place for a year and that the Government waited until they had his reports for a year before they accepted and paid for the tanks. Upon arrival at Ft. Leavenworth, we were taken to the barracks where the soldiers were quartered and they keep several thousand here. From the barracks, we were taken to the sewerage disposal plant which is the Septic Tank System. First we were shown a reservoir all tightly enclosed into which flowed all the sewerage from these barracks. Then we were taken outside and shown where the septic beds were. There are six of these beds in three pairs. The first two pairs are covered—neither sunlight or air getting into the sewerage. The theory being, as I understand it, that in the absence of air and sunlight, the bacteria which are very prevalent in this filth increases amazingly and that they devour this stuff. There is a certain amount of filtration in the bottom of these beds and a certain amount of oxidation. The stuff then goes to the second pair of tanks which are also covered over, and into which no sunlight or air can penetrate. Here the bacteria further consumes this stuff and the further settling and oxidizing goes on. It then flows on into the third pair of tanks which have openings in the surface to admit sunlight and air, or daylight and air, the theory being, as it was explained to me, that the daylight and air destroy this bacteria, which have in turn aided in destroying the filth. From this third pair of tanks, the water at this particular place flowed on out into a creek that ran along the edge of the ground, and I am here to tell you that I saw this water, scooped some of it up in my hands and smelled of it, and it was

just as free from odor as any clean water and if you had been a wanderer up the stream and been thirsty, you would have unhesitatingly drank this water. We filled a bottle with this water and took it back to Elgin, and at the end of the seventh month there was a green skum that formed on the water. Now this is to illustrate what daylight and air will do to bacteria, and if daylight and air will perform feats like this, you can appreciate what they will do to bacteria in your stables; so do not underestimate the importance of air and daylight in connection with the production and handling of milk. I don't believe it is possible to have too many windows in a dairy barn. I believe they should be so constructed with iron supports, allowing a continuous row of windows along the entire length of the barn, and as many as possible on the end. Windows arranged so that they will open and so that screens can be used on them. The value of the lives of the cattle saved on account of this good air and light will more than pay for the increased cost.

Milking Methods.

Too much care cannot be taken in this most important work. It costs the producer no more to milk cleanly than to do it otherwise if he once forms the habit. Guard against uncleanly habits on the part of the milker. It is desired that he be attired in clean overalls and jacket; these need not be expensive and can be slipped on just before milking. The hands of the milker should be washed clean and dried before he begins his work. Much may be said as to the method of milking, but it is understood by all practical dairymen that a cow should be milked with "dry" and not wet hands. Many have acquired the habit of milking "wet", as it is usually termed, and it may be hard for them to reform, but if they will observe the filthiness of this practice they will recognize this as a great source of contamination.

Milk as it is secreted in the cells of the udder, is germ free. If it were possible to get the milk in this condition into germ free receptacles, and if it could then be kept free from contamina-

tion, the milk would keep indefinitely. But this is impossible. A few germs always work their way up into the cavities of the cistern above the teats and multiply enormously, owing to the favorable conditions existing there. If this first milk, or foremilk, as it is called, is milked into the bucket, the practice of a good many milkers, we can see at once that contamination is introduced at the very beginning of the milking process. It is advisable to throw this foremilk away, and really there is little loss, as it is not very rich in fat.

The up-to-date dairyman will pay particular attention to cleanliness of milking. It is a sad fact that this particular point is so often neglected; we are apt to be in a hurry at milking time, or we may have a slovenly man milking and fail to keep a watch over him and caution. The preparations for milking good, clean milk are very simple and should come as naturally as washing one's face and hands before eating.

It is a distinct advantage to keep the cow's coats in good condition by a regular application of the currycomb and brush. In this way loose hairs and particles of dirt are removed instead of remaining to drop into the milk pail; where the hairs on the udder and belly are long, clipping them short will add both cleanliness and comfort to the cow. Any man should have as much pride in his cows as in his horses and he would not let the latter go out on the road with rough dirty hair. It has been proven that twenty times as much dirt falls into buckets from simply soiled udders as from one wiped with a damp cloth and 100 times as much from a dirty udder. Milk absorbs odors so readily, great care should be exercised to have air in barn clean and fresh at milking time. Use of feeds has a wide influence on barn air. Hay, dusty or strong smelling foods, such as silage, turnips, etc., should never be fed until after milking. Hay and dust is loaded with bacteria and most of trouble experienced with silage tainted milk comes from feeding previous to rather than after milking. Handling hay or grain just before milking time has been shown to put twice as many bacteria into the milk drawn immediately afterwards, while the handling of dry corn

fodder put three times as many in. Not stripping the cow thoroughly seemed to increase the number of bacteria in the next milking. Different milkers showed a big variation in the number of bacteria in the milk drawn by them, some men producing milk with only one-third as many bacteria under similar conditions. Boiled water in which the milker washed his hands before milking was shown to contain 45,000,000 bacteria per cubic centimeter. All of these and many more figures might be given to emphasize the importance of this part of the work.

Cows should have ample bedding, but this bedding should not be disturbed immediately before milking, inasmuch as that will cause the air to be filled with small particles of dust, a large share of which will find its way into the milk bucket.

The dairyman should always bear in mind that in handling milk he is dealing with a food product. Therefore, if any of his cows should be diseased or in ill health, or give gargety milk or bloody milk, this milk should not be used for human consumption. The milk which the cow secretes immediately after calving should not, of course, be used for four or five days, or until the milk has become normal; nor should cow's milk be used for the thirty days immediately before calving.

Under ordinary farm conditions, I would recommend the use of a small top milk pail. An opening six inches in diameter exposes approximately one-fourth as much surface to collect dirt as does a pail with an opening or top of 12 inches. If the small opening is not quite vertical so that the milk enters the pail from the side, still less dirt will get in. Having taken these precautions to secure clean milk, it should be removed immediately from the barn and not poured from the vessel to another in air laden with odors from the manure and dust from the feed.

The air in the barn should be as pure and fresh as in a sanitary home. Such systems are provided for. I will refer to one of many, the King System of ventilating; the air is taken in from the outside of the barn near the ground, passes up through an air space in the wall and is released near the ceiling. This method not only prevents draught, it forces the bad odors on to

the floor where it is drawn off through these flues and out through the roof. It is that important that these flues that suck out the bad air should have their opening near the floor, so as not to get the warm and purer air that is up near the ceiling. The benefit of having the fresh, pure air released near the ceiling, not only drives the bad air to the floor but it forces back down amongst the cattle the warm air which is in the winter time a great benefit; where if this pure cold air was released near the floor, it would not only force the hot air out at the top without giving any of the benefit to the cattle, but it would also force this foul air and odors up through the stable before it was released, which is undesirable. They should be kept near the floor at all times. The flues both for the bad and good air can be made of tin, or sheet iron pipe. A flue two feet square inside measurement will provide enough air for twenty cows. This is the intake flue. The bad air flue should be the same size. Increase the number of flues in proportion to the number of the herd.

Care of Utensils.

Tinware is undoubtedly the most satisfactory material for dairy utensils. Wooden vessels are very objectionable, inasmuch as the pores of the wood absorb the milk, and therefore, soon become foul. In purchasing vessels those which are durable and well covered with tin should be selected. The corners should be flushed with solder so that the milk will not have hiding places, thus affording an opportunity for germs to grow. All utensils should be washed with a brush, as it is far more sanitary than a cloth, which will soon become foul in spite of the efforts to keep it clean. Greasy soap powders should be avoided. There are many kinds of powders on the market that will dissolve dirt and grease and are still sanitary. If nothing better can be obtained, either sal soda or borax may be used. One of the best purifying agencies that the dairyman has is the sunlight. After the vessels are washed, they should be exposed to

the sunlight and air, away from the dust, and placed so that they will drain well.

Another factor in the milk problem to which all concerned should give attention is the practice prevailing in places of not washing milk cans immediately on emptying. Milk is allowed to spoil in them, and when the cans get back to the farm, they are in a condition that no vessel intended for milk should ever be allowed to go into. Somebody is responsible for this neglect; the responsibility should be fixed and the evil corrected.

The milk should be strained as soon as possible through several thicknesses of cheesecloth. It is advised by some that milk should be aerated to remove animal heat and the odors absorbed from certain foods. Although much may be said in favor of it, great care must be exercised in aerating milk. If a farmer is in doubt whether to aerate his milk or to cool it, it would be better for him to cool it, for the reason that simply aerating will not reduce the temperature of the milk sufficiently. Aerating must be done in a very cleanly, sweet smelling place, otherwise during this process the milk will absorb undesirable odors. In case the milk is not separated it should be cooled down at once.

A clean, airy milk house is a necessary adjunct to the barn; this should be built with several things in view. First, it should be a distance from the barn, hog pens or other contaminating surroundings, and should stand on a well drained spot; milk very readily takes in and absorbs all sorts of odors, and if it is not kept in a place where the air is pure, the flavor of the milk itself, or any of the products made therefrom will be seriously damaged. But the milk house should not be too far removed from the barn on account of the inconvenience of carrying the milk so far. Every pailful of milk, as soon as it is drawn from the cow, should be carried to the milk house and there cooled at once; while this method will require a little more time and labor, it will insure a product of far better quality.

The illustration given below plainly and forcefully shows how necessary it is to keep milk at a temperature as cool as possible in order to retard to the utmost the development and multiplication of bacteria in milk.

Multiplication of bacteria in milk held at different temperatures:

		Relative number of bacteria at the end of—				
Milk held at—		0 hour.	6 hours.	12 hours.	24 hours.	48 hours.
68 degrees F.....	I		1.7	24.2	6,128.0	357,499.0
50 degrees F.....	I		1.2	1.5	4.1	6.2

A tight floor in the milk house is indispensable; cement is by far the best, as it is easily cleaned and there are no pores to absorb and hold spilled milk or other refuse. While the initial cost is more, the final cost is less.

Milk sours during thunderstorms, not caused by the electricity in the air but the hot damp atmosphere just preceding a storm, (heat favoring the growth of the bacteria) which causes the souring of the milk.

As I said once before, I am quoting from the Government Officials and State Officials regarding the different rules established and where I have used statistics, and I want to give you below the report of Profs. C. B. Lane and I. C. Weld of Dairy Div. Department Agriculture to Hon. Secty. of Agriculture, on competitive milk exhibits.

“Most common defects found and those most readily seen.”

I. Foreign matter in bottom of bottle, consisting usually of particles of manure, barn bedding, etc. This indicates careless and unclean methods in production and handling.

II. Common defects in off-flavored milk from variety of causes, mostly—

1. Strong flavored feeds, such as turnips, garlic, etc.
2. Feeding certain feeds or silage.
3. From odors from silage and manure in stable.
4. Particles of manure and dirt getting in milk.
5. Bottles improperly rinsed after being washed with wash powder.

Dairymen readily detect these defects when they are pointed out and appreciating the importance remedy them willingly.

Principle defects found on dairy farms were unclean stables and lack of proper ventilators—some defects found in the construction and equipment, cleanliness of milk houses, handling and cooling of milk.

The feed and water supply are generally good.

Many defects in cleanliness and handling the milk VERY important and should be universally and promptly improved. Results of contests of milk show that sanitary conditions of production and method of handling are more important than the fact that the animals were fine bred or of some particular herd.

Before concluding, I want to quote from a recent publication what they have to say about the food value of milk, and we should do all we can to encourage the publicity of the food value of milk. The investigations which are going on all over the country as to the cause of the high price of food in every instance has brought out the fact that milk at the price is the cheapest food on the market. The more the public hear of this, the more they will look into it and the result will be an increased consumption of milk and milk products, *provided the milk and milk products are sanitary and clean in flavor and odor*. This increased consumption of milk and milk products cannot help but raise the price through the increased demand to the producer. So you will readily appreciate what I said at the beginning, the necessity of remembering at all times that you are handling a food product that is most generally consumed raw.

Cost of Nutrients in Whole Milk and Skim-Milk.

Just as the nutritive value of a given food depends not simply on its chemical composition, but on its proportion of digestible nutrients, so its real cheapness or dearness depends not on the price per quart or per pound, but on the amount of digestible nutrients which a given sum will purchase. Milk is economical, in the sense that it contains no refuse, such as the bone and gristle of meat, the shells of eggs, and the skins and seeds of vegetables. Moreover, the proportion of its nutrients which can be digested and utilized by the body is, under ordinary cir-

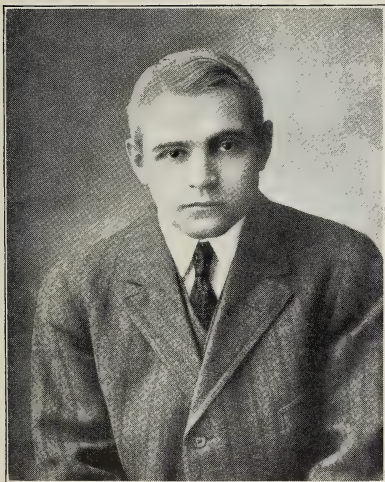
cumstances, larger than that from most food materials. The thing which might make milk expensive is its diluteness—that is, the large amount of water which it contains in proportion to its solid matter.

Of course, in comparing milk and such material as dried beans, one must take into account the fact that the beans will absorb considerable water in cooking and that a pound of them ready to eat would not contain as much nourishment on account of this water, while milk is consumed as bought. In addition, the cost of cooking must always be considered in connection with foods which are not eaten raw.

Bearing these things in mind, we see that milk at all but the highest prices assumed is a cheaper source of protein than any of the animal foods except cheese, very cheap meat, and salt fish. At usual prices skim milk furnishes protein more cheaply than any common animal food except salt fish. The protein of vegetable foods is less expensive, but on the other hand, as prepared for the table is less thoroughly digested. Under ordinary market conditions milk, and even skim milk, is cheaper source of body fuel than any of the usual animal foods except cheese and salt pork, but it is a dearer one than the usual vegetable foods. Here again, however, the milk furnishes the ingredients in a form more readily and thoroughly digested than the vegetable foods as ordinarily served. Milk, then, is fully as economical a source of nutrients as most animal foods but is dearer than most vegetable foods. It has the decided advantage of having no waste, requiring no time for preparation, and being more digestible than the vegetable foods. Skim milk answers the most important purposes of milk in the ordinary diet, and under usual market conditions costs at most only half as much as whole milk. Both whole and skim milk at moderate prices are therefore to be ranked among the most economical of our foods, not only when taken as beverages, but also when used in preparing other foods.

The Use of Milk in Cooking.

If freely used in the preparation of other foods, milk can be made to add considerably to the food value of the meals.



J. B. NEWMAN,
Assistant State Food Commissioner
of Illinois, Elgin.

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Many dishes are, of course, richer in flavor if whole milk is used rather than skimmed, but for the purpose of increasing the food value of the diet the main nutritive ingredient—that is, the nitrogenous material—as we have seen, is in the skim milk; if the extra fat is needed, it may be supplied in the form of butter, which is usually a more economical source than whole milk, or in the form of lard or other culinary fat.

Most persons consider that the choice between bread made with milk and that made with water depends simply upon the taste and appearance. There is, however, a difference in the food value, as will be seen from figures showing the average composition of various foods prepared with milk and of similar dishes in which it is not used. According to the figures which were taken from analysis made at the University of Minnesota, bread made with skim milk is richer in total solids, protein, and fats than otherwise similar bread made with water. The differences are not very great, but they are well worth considering, especially where skim milk is a drug on the market. The importance of skim milk in bread making has also been demonstrated experimentally at the Maine Experiment Station.

Milk soups furnish an excellent means of increasing the food value of a meal or of using up superfluous milk. Sometimes the milk is mixed with “stock” made from meat, and sometimes, as in vegetable purees, it forms the basis to which the pulp of some vegetable, such as beans, peas, potatoes, corn or celery, is added to give flavor and “body.” Oyster stew made with milk owes its food value more to the milk than to the oysters.

Milk or “white” and “cream” sauces are also very useful, not only for the nutritive material they supply but also as a help in using up “left overs.” Bits of meat can often be made very attractive by serving them on toast minced and “creamed,” and many warmed-over vegetables are improved by the addition of milk or white sauce, while the same sauce also helps in giving variety in winter when vegetables are scarce. No end to the puddings and desserts, ice cream, etc., made from milk or cream.

Production of milk reasonably free from bacteria is simply a question of cleanliness.

In conclusion, I may sum up by saying that the essentials for wholesome milk from the standpoint of the producer are healthy cows in healthful surroundings, milked by clean men, in air free from dust and odors, and the immediate cooling of the milk. Then keeping in mind at all times until the goods are delivered to the consumer, that this is a food for human beings and guard and handle it accordingly.

Chairman: One of the main features for deriving information is to ask questions in regard to the addresses that are given. Are there any questions.

Mr. Lloyd: What is the objection to keeping horses in the same stable with dairy cows?

Mr. Newman: It is not sanitary, more care must be taken with cows.

Chairman: Mr. Newman is trying to show us what we ought to do to better our condition of things.

Dr. Peters: The most objectionable feature would be the ammonia from the manure.

Mr. Joseph Newman: What are the Commissioners doing in regard to the oleomargarine proposition?

Mr. Newman: To those who are unfamiliar with the situation I would say that we have twelve inspectors throughout the large State of Illinois.

To illustrate: Chicago has fifty-four for the city while we have only twelve for the State of Illinois. These inspectors have to watch the oleomargarine, all the food products, the city milkmen and the grocery men. They have to give up more than one-half of the force to the oleomargarine and over sixty per cent of the prosecutions are on oleomargarine.

The first cases are those of complaint; when a complaint is made the inspectors go out and catch the fellow. Since I have been connected with the Department we have never failed to catch the man. Sometimes we have gone to the houses, got behind the door and taken the man. These problems are the greatest factors, they get the product for 13 cents and peddle it for 28 to 30 cents. After we catch them, if they do not want to go before the Justice of the Peace and plead guilty, they go to the State's Attorney's office. If you have had any experience you know how long a man can string out his case. We have cases started in 1908. You may say, "Why do you stand for it." We cannot help it, if they convince the Judge. We are working hard on the oleomargarine proposition, we have over one-half of the force on it. We have cases in East St. Louis, Pana, Kankakee, Bloomington and Chicago now.

A complaint came to us day before yesterday on the south side that they are putting out oleomargarine colored with coal tar color and calling it butter. The more cases we can get on one man the greater the chances are that he will quit. These men are fined; the first offense is \$50.00 and costs which average about \$12.00. The second case the Judge can make it \$100.00. The Supreme Court of the State has lately given out a proposition that we cannot try a man if he pleads guilty, we cannot fight him. We are very strong on the proposition for we have this opinion of the Supreme Court that confirms it.

All we want if anybody finds any oleomargarine, we would thank them for the information; for, as I said before, the inspectors are so busy that they cannot find all the cases.

Chairman: I expect that answers the question.

Mr. Newman, We have the largest appropriation for enforcing the laws of any State in the country excepting New York; they gave us \$60,000, but only twelve Inspectors. You cannot weed it out with twelve Inspectors.

We caught a fellow in Evanston lately in an automobile, and as I said before we have never failed to get one, and have never

failed to get a conviction after we got him. The Legislature limits the number to twelve Inspectors, six Chemists, one Clerk, one Assistant Commissioner and one Commissioner. We make more oleomargarine in Illinois than in any other State in the United States. Illinois is the largest food manufacturing state in the Union and the second largest food consuming state. We have great demands on us from the cities for city milk supply.

Chairman: We will have to proceed with the program. After the meeting this morning one or two members of the Committee will be at the rear door where you can buy the tickets for this banquet tonight.

PRODUCTION OF CLEAN MILK.

By

Prof. Hunziker, Purdue University, Lafayette, Ind.

We are fortunate this morning in having with us Professor Hunziker of Lafayette, Indiana, Chief of the Dairy Department of Purdue University.

Mr. Hunziker: Mr. President, Members of the Illinois State Dairy Association: I suppose it is necessary for me to say that I am very glad to be with you at your Convention. I ought not to say it for of course you know it. I wish to thank your officers for their kind invitation to me to come over here. I assure you I appreciate the invitation very much.

Now my subject this morning is "The Production of Clean Milk," and I want to ask you what you expect me to say after listening to this most interesting address by the last speaker. I have been wondering in looking over the program what in the world I could tell, what would be of interest and what would be of instruction and what would be new that has not been said. It seems to me that the subject has been treated from all sides. It has come up now three times during your Convention, and I am really almost afraid it has been exhausted, and yet judging from the conditions, or at least some of the conditions under which milk is produced in my own state, Indiana, and the condition with which I am quite familiar, and conditions I expect are not so different in Illinois, perhaps after all the gospel will bear repeating.

You recall John Wesley asked his wife why she told the children the same thing over and over again to which she replied: "John Wesley, because once telling is not enough," and I feel that we have much the same proposition here. The subject of clean milk is of such enormous importance that the dairymen can never know too much and it cannot be repeated any too often to impress it upon the minds of our dairymen.

Now it is not my intention at this time to go into the details of sanitary milk production for, after all, I believe the average dairyman knows just as well as we do how to produce sanitary milk. He knows he must keep germs out if he is to keep milk clean. It is not so much ignorance as it is negligence. It is ignorance of the enormous importance of doing it in the right way. It is along this line that I shall talk more, rather than along the line of the production of clean milk. For convenience I have put down a few points, I have divided my subject into three parts:

Financial significance of quality,
Producers' responsibility, and
Vital factors in the production of clean milk.

This has all been covered by the previous speaker, and the best I can do is to make you look at it from a different angle, that is all I can do; this relation of care to quality. You will agree with me that there can be no quality unless there is care. Unless we take the proper care of the milk we cannot expect good milk. It is impossible to have it. There is a natural law of cause and effect and we cannot get around it, and this can be easily shown, the relation between care and quality is so intimate that, for instance, if we visit the principal dairies supplying any town or city. Take Vandalia for instance, if we visit these dairies and inspect them, we do not have to go to Vandalia, we know the quality of the milk consumed. You examine milk that is received here and you can tell what kind of care the milk has received on the farm. That is your relation. The butter judge examines butter at the market end, he doesn't have to go to the creamery, he can tell the cause of the trouble right away. There is the relation of care and quality.

If you take a trip through the curing room of a cheese factory and you see the ends of the cheese bulging, or if in boxes and raise the covers you know right away that the cheese was made from milk that has not received the proper care; it was gasy milk that went into that cheese.

If you see your condensaries receive returned milk that was

rejected on account of poor quality you know it is largely because that condensary received and accepted milk which was not fit to be made into condensed milk. Now the symptoms are so clear you cannot help but diagnose the case. We need say no more about it. The milk needs good care if we want to produce a good quality of dairy products.

Now we come to the dollars and cents problem, the financial part. It is true that within recent years the better dissemination of information has educated both the producer and consumer considerably along the value of good milk, yet at this time, the full value of cream is not wholly appreciated either by the producer or the consumer. Too much of the milk that reaches the market for direct consumption is milk that is unfit to be used in the diet of the family. It is unfit to go to feed the infants and invalids, whose whole source of food it is. Too much of this milk does not prove worth the real value of clean milk and, therefore, it sells for a price below that which good milk should sell for. Too much of our butter and dairy products reach the market in a condition where they grade several points below the extras, the result is that this inferior quality lessens the appetite of the consumer and it lowers the price.

Butter has become a necessity in the diet of every family. We would not think of eating our bread without butter; with good butter we can make a satisfactory meal. You put some poor butter on your bread, and if you are not disgusted then I miss my guess. If we have to choose between no butter or poor butter we will eat our bread dry, unless we wish to substitute oleomargarine, the enemy of the butter maker.

Good cheese is easily digested but poor cheese will drive the guests away from the table. It is the inferior quality of much of our dairy products that causes us throughout the country a loss that is enormous. We dairymen are wasting every year millions upon millions of dollars, millions which could be saved if we gave the consideration of quality and care the first consideration in our business. You may think I am exaggerating, the best butter judges in the country tell us that nine-tenths of the butter does not grade extras; it means that the greater part of the

butter sells one to five cents below quotations and that is an enormous loss.

Look at the undesirable country butter that we find every year in our country stores; car loads of it are dumped into our soap factories. Just as long as we make the cow tributary to the soap factories, just so long dairying will not be profitable. Look at the butter that is dumped into these factories at 15 cents below quotations. Are we not losing millions of dollars here annually? With the cheese you have the same proposition; also the milk is not bringing the price good milk should bring.

The total milk production in the United States in 1903 was sixty-seven billion pounds of milk which was distributed into butter, cheese and condensed milk. Let us get down to business here. Now suppose we got a little higher price by taking better care of our milk and, therefore, being able to make better dairy products. Suppose our creameries begin to grade their milk and cream. In other words suppose they are putting a premium on the production of good clean milk, and suppose we are getting out a good share of this country butter, and let us assume that the butter will average 2 cents higher per pound. Let us assume the same thing for cheese, a 2-cent raise. Let us assume that the better care of the dairy farmers enables to put a more sanitary milk on the market for direct consumption, that is milk that will bring 1 cent more per quart, here is the result:

Gain in butter sales....	\$ 33,000,000
Gains in cheese sales...	5,000,000
Gains in milk sales....	104,000,000

\$142,000,000 for this country.

This may look exaggerated, but if you come to study this matter out, these figures are entirely within the limits of possibility.

Take the State of Illinois, the total production of milk amounts to 6 per cent of the total for the entire country. This would be eight and half million dollars for the State of Illinois. We would gain this by the proper care of milk. It is worth

while to pay attention to this care of milk from a financial standpoint.

But there is another side to all this, a side quite as important and even far more reaching. I am referring here to the relation of the quality and care of milk to the health and life of the human family, and this brings us to the producers' responsibility, and I believe you will agree with me when I say every farm association or corporation that is producing and selling any article of human food becomes responsible to a greater or lesser extent for the life and health of the human family. Milk is probably one of those foods which is used to the greatest possible extent. There is perhaps no other food article that is used as much in our family diet as milk. It is estimated and also statistics show it that the average consumption of milk amounts to about 7-10 of a pound per day. Every man, woman and child drink about two-thirds of a pint. This figure stands for milk as milk only. It does not stand for butter, cheese, ice cream or other dairy products. If you figure that in, it will be greatly in excess of this figure. When we consider that the bulk of all the milk that is used for direct consumption goes into food for our babies, those helpless little ones, whose source of nourishment this milk is, when we consider that these little ones are less able to take care of milk that is unclean, these little ones are very susceptible, their delicate constitutions cannot long withstand these weakening influences, then we may be in a position to realize and appreciate the enormous responsibility the dairyman assumes when he sells milk.

It has been reported that about one-fourth of the infants in our large cities die before they reach the age of five years, and we have fairly good evidence that one of the chief causes of this high death rate is the poor condition of the milk when it reaches these city families. It reaches them in many cases not fit to be used as human food. The importance of this subject,—and if you have children of your own you will appreciate these facts,—the importance of this subject is of such magnitude that no self-respecting dairyman can afford to ignore it. The dairyman is holding in his hands the life and health of the coming generation,

and it is his duty to protect the public from unclean and unsanitary milk. So much about this side of the sanitary milk production.

Now we come to the vital factors in the production of clean milk. I see my time is short. I repeat what I said on the start. Most of us really know how to produce clean milk but we do not appreciate the enormous importance of doing so.

The production of wholesome milk can be summed up in seven short words: healthy cows, wholesome food, cleanliness, low temperature; that is the whole thing in a nut shell. It is reasonable that we cannot get healthy wholesome milk out of a cow that is diseased. First of all, if a cow is freshened she may put diseased germs in her milk; again if the cow has a local affection or if she is in a run-down condition her normal body functions are not normal and milk production is a physical function. When she is on the farm it is just possible that some of the poisons do not pass off through their natural channels and they may get into the milk. Again when cows are not in normal condition, for instance, it often happens that the albumen increases when cows are not in a normal condition but even the properties of these constituents change and may cause disturbances, such milk cannot be made into a decent quality of milk products. Then again there is a time before the cow produces her calf and shortly after when her milk is not fit for consumption.

It has been found by recent investigation that the cells which we call collostal cells appear forty days before the cow drops her calf. It is a good plan to keep back the milk of the last thirty days at least before calving and from five days after. It is not advisable to milk the cow up to calving time, it is a good idea to dry her up two months before. If you happen to send such milk that you get thirty days before or within five days after, if you take such milk to the condensary, you are making all kinds of trouble and spoil the whole lot of milk with which this milk you deliver is mixed.

The next point with reference to the cows is the feed. This has already been discussed this morning. I might add we feel that any food that does not interfere with the physical condition

and does not give the milk a bad flavor is perfectly safe to feed to the dairy cow. It is not the direct feed on the milk, the food is converted into blood and the milk takes its nutriment from the blood. It is that certain kinds of food have a bad effect on the animal. If you feed decayed roots, naturally the milk cannot be good for that kind of food does not agree with the animal. Of course, there are certain kinds of foods and also weeds which put flavor into the milk. Such foods as certain roots, for instance, onions, also turnips tends to put a bitter and undesirable flavor into milk, also certain weeds as chicory and many others. If you want to produce milk of good flavor you must keep these things from the cow. Silage very often, and I have heard a great many discussions on the flavor of milk from cows that have been fed silage, and Urbana has demonstrated conclusively that while silage may add flavor and the public prefer milk from the cows fed silage, yet sometimes the milk condensaries refuse to take milk from farms where they feed silage. This is ridiculous. When silage was first put up they did not know how to put it up and the result was that much of the silage did not come out well and did not have a good effect on the milk. They started condensed milk at that time and they are still where they were fifty years ago, they still think silage is a bad thing, where, as a matter of fact, you can make just as good condensed milk from silage fed cows as you can from cows not fed on silage.

It is an insult for any big company, as we know there are, to prohibit the feeding of silage as long as silage is the most economical and most satisfactory food we can feed to our cows.

A word about the water: I do not know, and I do not know as any one else knows, what the effect of bad water is on the milk. It is natural or reasonable to say that good water has a beter chance to produce good milk than unclean water. Now the cow needs a great deal of water. Why? First of all because a large portion of the milk is water, over four-fifths of all there is in milk is water. Then again the cow is an immense machine, doing a lot of work.

Johanna will produce over 27,000 pounds of milk in the year,—1,000 pounds of butter fat in a year, what an immense

amount of work she is doing. The cow must have plenty to keep her system in good condition. You cannot expect the cow to get all she needs if you send her down to the pond where she has to stick her muzzle through the ice in water which is cold. It is necessary if the water is given out doors to warm it at least to 50 or 60 degrees so that the cow will drink all she requires. Impure water has a bad effect because it has a bad effect on the animal, it disturbs the health and indirectly affects the milk secretion.

Now we come to the cleanliness and there, of course, a man could talk all day. We want to say but little as we have not the time for more and your previous speaker has brought out what cleanliness means. The chief reason that milk goes to pieces, gets gasy, sour, stringy, etc., is because it contains bacteria. These bacteria are so small that we cannot see them and it is hard to fight when we cannot see the animal. The only reason we know that the milk contains bacteria is because it spoils. We further know that bacteria are widely distributed throughout nature; there is hardly any substance that does not contain bacteria. We find them in water, in soil, we find them on the skin, on the hair and they are especially abundant in all kinds of dust and filth and dirt. Dirt is the natural breeding place with bacteria. All those who are familiar with the production of milk under ordinary conditions will know it is easy for bacteria to gain admission.

I want to say you cannot expect to produce clean milk if we compel our cows to go knee deep in mire before they get into their stables, their udder becoming covered. You cannot expect to produce clean milk in a stable like that. A man must be cleanly who is milking. He must appreciate the need of taking a clean cloth and wiping the udder; he must appreciate the need of washing his own hands, and he must further appreciate the fact that he must draw the milk into clean utensils. We cannot keep it pure unless we have clean utensils.

Let us say a word about the straining. I think there is a misconception about the straining of milk. Let us not handle the milk in any old way because we are going to strain it. After the

filth has gone in it stays in; about two-thirds will dissolve before it gets to the strainer. If you have any idea of filtering out bacteria, kindly disabuse yourself of that idea because you cannot do that. The best a strainer can do is to pick out the large particles like straw, etc. What kind of a strainer is an important point.

My experience has convinced me that one of the most dangerous things you can use is the cheese cloth strainer. When I was connected with one of the large condensing companies of the east, I fought the use of a cheese cloth strainer. I appreciate the fact that it is an effective strainer, but the trouble is that not one out of ten men who are using it can really clean it. There is nothing more difficult to remove than the particles even after it is washed and with washing powder too, you can still see particles of milk. It simply means that **you** are infecting that nice clean fresh milk with these bacteria **with** which the strainer is teeming. If I use a strainer at all I **would** use a wire one. You can use a brush and scrub it, and **you** can see it is clean. I feel that the strainer is an important point. In many cases it does more harm than good.

Now the **cooling** of milk is an important point. Bacteria are living organisms and if they are exposed to cold they cannot grow. They **remain** asleep as long as the milk is cool. The quicker the milk is cooled the longer the milk is kept. Now that is one of the greatest secrets: low temperature,—cool the milk down as fast as possible after it comes from the cow. That is one of the greatest things that you can do if you want to prolong the keeping quality. If you have ice you have no trouble in cooling it to 45 degrees; if you have no ice cool it to as low a temperature as you can.

Let me refer right here to your own milk in Illinois and what can be done and what has been done in your own state by proper care in the way of cleanliness and a low temperature. Mr. Newman has referred to it. Mr. H. P. Gurler sent milk to the Pan-American in 1900, and while the French and German milk spoiled and got sour in one day the Illinois milk stayed sweet for twenty-one days in spite of the fact it traveled 4,000 miles

before it got there. This performance was so unusual it created a great deal of criticism, and it was not until it had passed through the experts in chemistry who pronounced it unadulterated milk that the judges gave way to the admission of the American product and gave the producer the praise and respect he deserved for his cleanliness and low temperature.

Just one more word. I just want to say a word about the transportation and delivery of milk, here is a point that is neglected, and often by negligence undone the good we have done by taking the proper care of the milk on the farm. The days when the dairyman milked his cow at the door of the consumer are gone. From a sanitary standpoint that was the most satisfactory way of peddling milk. I might say perhaps that in Switzerland in the country they are still practicing that method in delivering milk. They have a co-operative system of pasteurizing their cows. They hire one man to take their cows up on the Alps on certain pastures and the creamery is right there and every afternoon the cows come to the door of that factory and are milked there and the pail of milk is poured into the vat. That is one of the reasons why the Swiss cheese has obtained such a reputation.

Now the handling of milk in unclean cans and the peddling of it in an old democrat wagon declared unworthy for any purpose is a practice not in harmony with sanitation. The selling of milk through the grocery store and upon its arrival put in a dark corner in unclean utensils is a practice still more unsatisfactory, and yet these practices are still in use in many of our cities.

Unless the milk is taken to the bottling plant or to the factory, the milk that is used for direct consumption ought to be bottled on the farm and delivered in bottles. That is the only proper way of delivering milk for consumption. The bottling plants have done a great deal toward raising the sanitary condition of milk, and yet even as perfect as their equipment is, if they do not receive milk that has been properly taken care of, even they cannot turn out pure milk.

All the filtering, all the sterilizing or all the pasteurizing

will not restore milk to its normal purity. In transporting milk to the factory in hot days it should be covered with a wet blanket. In winter we should guard against freezing by covering the milk with a dry blanket.

I believe I have taken up more time than was allotted to me and I wish to thank you for your attention.

Chairman: Are there any questions?

Mr. Mason: Do gluten foods make milk broken? A farmer was telling me that it invariably made his milk ropy.

Prof. Hunziker: Was that milk ropy when it was drawn or did it become ropy afterwards? Of course it is possible that certain kinds of foods have certain effects on certain animals. We have received milk from 2,500 cows and in most of the barns gluten foods were fed and we have had no trouble with gluten milk. On the other hand the individual cow might have had something to do with it.

Mr. Mason: Does green rye have any effect on the milk?

Prof. Hunziker: The only thing I know of is that we have sometimes had trouble with buttermilk. That may not hold true every time.

Mr. James: Would you use a muslin cloth under any conditions as a strainer?

Prof. Hunziker: If I did I would use a new one each time.

Mr. James: Is it not a fact that if the strainer is properly washed and hung in the sun that the bacteria will be killed before it is used again?

Prof. Hunziker: I appreciate the fact that the direct rays of the sun light is the best natural disinfectant, but at the same time you are not sure whether your strainer is sterilized and the

chances are that it is not. Experience has shown that few men can wash a cloth strainer clean; it is a difficult thing to do. It ought to be boiled a half hour.

Mr. James: Would it not be a better practice to wash the best you can after the night's milking and before the morning's milking for there would be no sunshine then?

Prof. Hunziker: If I use cloths I thoroughly sterilize them for fifteen minutes. I think that will answer your question.

Mr. James: That is very good, but many of the farmers do not have steam and for that reason it is a difficult thing to sterilize.

Prof. Hunziker: The point I was getting at was the danger that might occur from using cloth strainers at all.

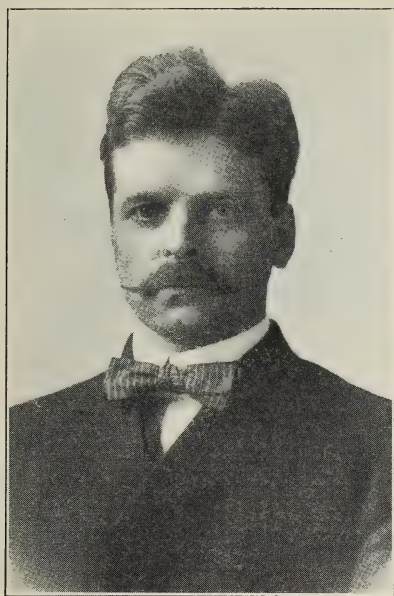
Mr. James: Is it not better to use a strainer and take out part of the dirt than have your milk sent out without any straining?

Prof. Hunziker: While you are taking part out you might put something in; if the strainer is clean it is a good thing.

Mr. Lynch: I would like to state a case in my territory. A farmer had the fashion of using the same cloth for months without washing. He strains his milk and hangs his cloth on a nail, when he comes to take it down to use the next time it is covered with flies.

Member: Are we to understand that it is better to be as filthy as you can than to be fairly clean?

Mr. Newman: We are to keep clean of this whole business by keeping clean in the first place. I think that a fine wire strainer, approximately 100 meshes to the inch, is the best kind.



PROF. O. F. HUNZIKER,
Dairy Department, Purdue University,
LaFayette, Ind.

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Chairman: Any other questions? If not, I would like to call your attention to the photographer's request that we meet in front of the old State House at 1:15. You will have to be there promptly as we have a very interesting session this afternoon and want to start on time. I hope you will all be at the banquet tonight, respond to toasts, and I know the ladies will do well by us in regard to the edibles.

Adjourned until 2:00 P. M.

Thursday Afternoon, January 20.

Chairman: Before we take up the program our Secretary has a few announcements he would like to make.

Secretary: The Association publishes a report of its meetings giving the discussions at these meetings, and we have a number of these reports here, but have neglected to speak about it since the first session. I hope each one will feel free to get one of these reports and take it home; you certainly will find some good information here.

I want to speak of the banquet that is to be held here tonight. The League has spent a good deal of money in arranging for this Convention, they have done it willingly and they have done everything possible to make this Convention a success. They feel that where an evening meal is served, good music is given and responses to good toasts that it will be memorable in connection with this Convention. Of course you cannot give a banquet for nothing. They have made arrangements with the ladies of the Methodist Church for this banquet and charge \$1.00, and that is not an excessive price, and we all ought to attend the banquet. Mr. Gilkerson, who is in the rear of the hall, has the banquet tickets for sale, and I have some, and I hope the Association will be well represented at that banquet tonight.

Chairman: We will open this afternoon's session by hearing a male quartette. We will hear from them now and then go ahead with our program.

BREEDING UP AND FEEDING DAIRY HERD.

By

T. J. Julian, Algona, Iowa.

Chairman: We are honored today by having a gentleman with us from our neighboring state and who is long versed in the dairy business, Mr. T. J. Julian of Iowa, and I take great pleasure in introducing Mr. Julian as the first speaker this afternoon. He will talk to us on: Breeding Up and Feeding a Dairy Herd.

Mr. Julian—Mr. Chairman, Ladies and Gentlemen of Fayette County and Brothers of Illinois: I have been somewhat puzzled to know why the Secretary of the Illinois State Association invited me down here to address the farmers of Southern Illinois, and in giving it quite a considerable study and in looking over the field after I came here, I have come to the conclusion that he wanted you to hear from a real dairyman and farmer, who is in the dairy every day and does his share of work on the farm.

In coming through St. Louis yesterday morning I came to the conclusion that Southern Illinois was not deeply interested in dairying; the size of the barns and the absence of the silos told me that you were not much interested, because when a man goes into the dairying business he must have besides good cows, good surroundings, and, as a rule, on the road up I found an absence of these essentials.

Up in Iowa where I live, you people would think you were in the Klondike regions because the thermometer goes down to 22 degrees below zero. It would seem, as far as your climatic conditions are concerned, that you would have ideal conditions for the running of a dairy. How your soil would produce I do not know. We have a deep black soil from two to two and one-half feet which you might say was quite inexhaustible. I should say

this was not very deep. You ought when you go into dairying know about the fertility of your soil and to know the greatest producing crop you can raise. I should consider that was what you wanted to know.

I beg to be excused for reading my address, but my time was so short I could not well commit an address to memory, and if I got up and talked without having written it off I probably would switch off on some other thing.

When a man contemplates going into some business enterprise or enlarging his present business, or seeking any change whatsoever, the first question that comes to his mind is, will it pay, that is, will it pay the interest on the investment, taxes, salaries, insurance, repairs or upkeep of property and return a reasonable profit. The real business man takes all these things into consideration, gives it deep study and finally decides only when his best judgment tells him it is a good investment.

Is this true of the farmer and dairyman? In the majority of cases we think it is, but in a very large majority of cases it is not true.

Let me say that when I went to Iowa twenty-two years ago grass land was worth nothing. Land had no particular value. We put our cattle out, paid 50 cents a season to have them herded, so it did not make much difference what we kept. We were sure to make some money.

Land is no longer cheap, and what seems a high price now will seem very low in a very few years. Labor is high in price and very much of it is inefficient and we see no hope of improvement. Automatic machinery is taking the place of much labor. Less men are required to do the work on the average farm than formerly. Today a man must be highly intelligent, must have considerable mechanical skill to handle the many kinds of intricate machinery, so as to get the most and best work out of them.

Nearly every farmer knows this to be so and most farmers, their sons and the best hired help are able to handle all kinds of machinery used on the farm successfully. I think down in Southern Illinois you can get better help at less wages than we can get in Iowa. Last winter I hired a good looking young man and set

him to currying the cows. He said, "Is this the way you do." I answered, yes. He said: "I will be—if I will do it." I said: "You will or you will get out." So he went, so you see the kind of help we get there. These young men are going to Dakota and getting homesteads. I don't blame them. We have to pay \$2.00 to \$2.50 a day and board them besides.

Two years ago I had a considerable amount of clover hay. I had never used a hay loader. I was unable to get help without paying large money, but I finally was successful in hiring a good strong man and we went out to put up the hay, and he said he would have to do the pitching. I was fifty-three and a slender man, and he was young and weighed 240 pounds. I was to pay him \$2.00 a day. I decided to let him go and I put in a hay loader, and I finally put up the clover hay with the help of a boy. Boys will do a lot of work and work cheap. I could get the boy to ride on the wagon and drive the team, and with the help of that boy I put in forty acres of clover hay.

When it comes to dairying and a herd of dairy cows, however, there is trouble ahead, or many would be successful dairy-men.

There are three essentials in successful dairying: good cows, plenty of good feed and good care and management. Without these three in combination, successful dairying cannot be maintained. Who are the men who are successful dairymen of our country? Are they not the men who read the best literature pertaining to dairying, who think and study on the best methods to be followed and that will fit their particular case, for what might be sound practice in one section of the country might be very unsound in another part. Good cows, good feed and good care with an intelligent, reading, thinking man behind the whole business will make dairying the most profitable line of business on the farm, while poor cows, poor feed and poor care will bankrupt a banker.

Now I want to say a word in regard to dairy literature. We have at our co-operative creamery 125 patrons. Do you believe out of those 125 patrons, even in Iowa, we could get twelve to read Hoard's Dairyman, or papers devoted to dairying interests?

Why is it that these men will not read or think or study the business that they are giving their whole lives to, and every bit of food they raise on the farm is going into those cows. Suppose a preacher wants to preach, does he not want to read the Bible? Suppose a lawyer wants to try a case does he not want all the books available, and if a doctor never studied medicine would we want to employ him? Yet dairymen will start in without knowing the first principles and expect they are going to succeed. Gentlemen, you will make a failure if that is the way you are going to conduct your dairy.

I lived thirty years in and around Elgin. I was born there in 1856, and if the Lord is willing I am going to be buried there in 1956.

Why is it that in every section of our great country we go, we find dairying carried on successfully and profitably by some men while others make no effort or a complete failure of the business, and why cry out, "Dairying doesn't pay." Two words explain the reason why one man is successful and the other a failure. One is knowledge, the other ignorance. Why is it that in the same community or locality with the same kind of soil, the same markets and other similar conditions, one person will be highly successful, while another will be a complete failure.

Let us look into the conditions surrounding these two dairymen, and try to discover the cause of the success of the one, and the failure of the other. The successful one is a reader of the best dairy literature; he keeps in touch with the Experiment Station of the state and applies dairy principles in conducting his dairy. He has the best cows to be had, well knowing that other things being equal, the cow is the basis of successful dairying. The other man reads little, thinks less and any old cow is good enough for him. Poor, ignorant man, my heart goes out in pity for him in his blind stupidity and ignorance for all the hard work he will do and the pittance he will receive.

Now let us see the difference between the good cow and the poor cow. Now I do not know how it is with you men down here, now in Iowa if any one would say anything about the dual purpose cow, he would be shot on the spot, how we all differ

so I am not much afraid of you men shooting me on the spot. Now what is the difference between cows? Suppose one cow gives a thousand pounds more than another! I have a neighbor who is a rich man. He has a great number of farms, but he got them by inheritance. He is interested in the bank, is vice-president, he is a surveyor, we are in the drainage district and he has all the work he can do at \$7.00 a day. He is supplying milk to one of the big hotels, he gets 4 cents at the hotel door. He made a brag that his cows were bringing him \$54.00 a year and they were dual purpose cows.

1,350 quarts at 4 cents a quart is a little over 2,700 pounds per year. He would be getting on that basis 30 cents a pound.

There is a man in our state whose cows are giving him over \$75.00 at the creamery. Suppose another man only made 1,000 pounds, suppose you increased another 100, and then you would not have it up as you ought; suppose you run it up another 1,000, you would have 5,800 pounds. A good Jersey herd would do that and they are not supposed to be great producers. Now you can see how easy it is for just 1,000 pounds of milk would amount in the long run to a great deal. Now you can see what a special purpose cow can do over a dual purpose cow.

There is a comparison between a special purpose and a dual purpose cow, and what holds in the past will hold true in the average, and I will leave it to any man who has had experience if that is not true, what is true of the past is true of the average.

Up in here in Wisconsin a Jersey man told me he was out to one creamery and he inquired of those men what those cows were doing. They were all Holstein cows, their average was 300 pounds per year. He visited another brother and asked him what his average was and he told him his average was 150 pounds and a steer calf. Now that steer calf was worth in his eyes \$150.00.

I said good cows are the basis of successful dairying. How are we going to get good cows? There are two ways, one by purchase, the other raise them. It is not my purpose to say to the man who has plenty of means what he shall do. He can

and usually does as he pleases; but it is to the beginner, or the man with small means I come with a message of hope and predictions of success if he follows out well-known principles of breeding. You have one great object in dairying, that is to obtain the greatest amount of milk and its products. Nothing else should interfere. You need dairy cows for dairying. Let no one persuade you that beef or so-called dual-purpose sires will get you real profitable dairy cows. Get the best dairy cows you can buy, or on the cows you now have, if they will pay a small profit over feed and labor, use the best dairy sire of the breed you like best.

I do not believe that any man ought to take up with a breed he does not like. I have men come to my farm to buy and if they talk other breeds I say: "You ought not to have bought of me." I tell them I will hitch up and drive to neighbor Quorten, he is a lawyer and he can make things look pretty good. I do not want any man to buy anything of me unless he thinks he will be satisfied. The best way to do is to let him go down and see your friend, and by and by he will come up and buy of me.

The selection of a sire is the most important act in breeding up a good profitable dairy herd. He should be a typical animal of the breed you have selected to grade up your future dairy herd. He should come from a long line of profitable producers, line bred. The cows should be well fed and cared for so as to produce a strong vigorous calf. The calf may be allowed with the cow for a few days, or it may be taken away at one day old. A calf well born that is strong and full of vigor has the foundation laid to build a strong, large producing cow.

Great care should be taken to see that it is always supplied with food suitable for its growth, never feed to excess but always enough. We do not believe a heifer destined for a dairy cow should be kept very fat, but rather fed those feeds that will make a good healthy growth and kept in a fine thrifty condition, but not very fat.

Hoard says one reason why the dairymen do not improve is when they go to purchase a sire they want to buy the cheapest thing they can, and low priced things are not always quite as

valuable. There is no breeder of pure bred cattle that can afford to sell a bull calf for less than \$100.00; there is no use trying to buy a cheap sire. When a man sells you a cheap sire it is sure the ancestors are not good producers. I had a case in my own herd, one was not worth her keep, the other one would give 75 pounds a day. Another time I raised two heifers, neither were worth anything. I sold all to the butcher. I do not want to perpetuate that in my herd.

A farmer comes to me to buy a young bull; here is one I will sell for \$50.00, here is another I will sell for \$150.00. Which would be the cheaper one? The one for \$50.00 would be poor at any price, the other you would undoubtedly make \$500.00 from before you got through with it. That is true.

Up in Iowa I have been preaching this. I have been advocating breeding back to their own sire where there was no general failing. For instance, if a sire should have a weak back, I would not do it, but if the heifers are strong I think it a good plan to breed back to the sire once. After that take an outsider of the same breed.

If heifers from the first sire are strong, having no weak points in general, and show good udder development and a milky foam with no undo weakness in general in the lot it might be the wise thing to do to breed them back to their own sire. If the sire's offspring is strong and vigorous, showing up strong the points of the best type of dairy cow, breeding back to their sire will strengthen and intensify these good points. You will also get a more uniform lot of heifers from this inbreeding, which, while it adds nothing to the heifers as large producers, nevertheless it has an intrinsic value and pleasing sight. Your second sire should be selected with even more care than the first, even remembering the higher the grade the ratio of increase in production will be less with each succeeding cross. Every heifer or nearly every heifer in the first three crosses will, in all probability, be much superior to their dams provided always the sire is from the largest producing dams. Never for a moment think of using only one breed in your grading-up process. Your first cows will be a one-half blood, your second a three-quarter blood,

your third a seven-eighths, your fourth a fifteenth-sixteenth, and your fifth a thirty-one thirty-two, or practically a full blood, and for all practical dairy purposes are just as good, and an expert can find no difference between them and pure breds.

This wonderful cow owned by A. O. Auten, I do not know what sire she could be matched with that would produce an offspring that will equal herself; I think it is doubtful if one can be found. Take Johanna, it is doubtful if she will produce an offspring like herself. She has one son but it is doubtful if he will produce anything her equal, so the higher the grade the less chances of increasing the production. You can see it in the first and in the second; it is so in horse breeding. If you breed a standard breed after the third, fourth or fifth it is hard to discern any improvement.

I have a chart here which shows 220 pounds of butter fat in a year, first cross gave him 261, the second sire gave 272 pounds of butter fat and the third sire gave 384 pounds of butter fat. These are the same sires. The only way I can figure out how he gets this wonderful increase with the same sire is that the cow had been poorly fed. He feeds her up. If you get a good cow and feed her up you can increase her yield 50 per cent. The probabilities are this cow had great producing qualities but she had never been fed to show what she could do. If you have the same sire and you get 384 pounds it shows that you have increased the feeding and care. This shows you that feed and good care are among the chief requisites in getting the best in that cow.

There was a man over in Iowa when the weather was 22 degrees below zero had his cows out walking in the corn stalks with snow two feet deep. He did not know the first principles in caring for these cows. Any man that would allow any kind of stock out in such weather ought to be sent to the worst place I ever heard of.

Suppose for instance you had 30 cows, there is \$750.00 the first year, yet you have that penny held up so close to your eyes you cannot see the dollar ahead. That is what they do at the New York Experiment Station. Those professors do not know

any more than the rest. I was down at the Iowa Experiment Station and I said to the railroad official: "How can you afford us transportation?" He said: "We have got a selfish interest, the more butter you produce the more freight we will get to carry. We do not care for you fellows, it is the freight we are after." So they are furnishing us trains to go over the country and talk an hour at each station. Iowa appropriated \$5,000 a year to carry on the work of Iowa, so we have hired Mr. VanPelt to go all over the state, free of charge, and talk dairy to the farmers at any place he can. We are going to get through with that \$10,000 and then we expect that Legislature to give us another \$10,000.

I think I have shown you what can be done by buying a full bred sire, and you can do it here just as well as in Iowa, Minnesota or any other state. If I had my choice I think I would rather do it here than up there. You seem to have ideal conditions, but of course I do not know what your soil is, but other things being equal, I think this would be a grand place to run a dairy.

The next question for discussion is the feeding of the dairy cow. We think many farmers are discouraged from entering the dairy business by being told that it requires a lot of high priced boughten concentrates. Such, however, is not true. Feeds for the dairy cow can be wholly raised on the farm, or nearly so, so that very little money need be spent in the purchase of feed to make up a ration. Ensilage comes first as the best and most economical feed of the dairy cow. From thirty pounds or more per day for small cows and forty to fifty pounds per day for large cows will be sufficient for part of the dairy ration. As far south as Vandalia, where this dairy meeting is held, we believe cow peas planted with the corn, so as to have a good stand and all harvested and cut into the silo together would give an almost ideal balanced ration. In addition to this all the clover hay, or better still alfalfa hay, where it can be grown successfully, they will eat. Corn ground fine mixed with oats or bran and a pound or two of cotton seed meal will give you all nutriments needed, to produce the largest amount of milk.

Professor T. L. Haecker, the best authority in the world on feeding dairy cows, finds a cow needs for a maintenance ration per hundred pounds, .07 protean, .07 carbohydrates, .01 fat. These decimals multiplied by the weight of the cow will give you the ration required to maintain a cow. He also found that the higher percentage of fat in the milk the more feed was required to produce a pound of milk; thus in milk of 3.5 per cent fat, .042 protien, .21 carbohydrates, .016 fat in 4 per cent milk.

.046 protein, .23 carbohydrates, .018 fat in 4.5 per cent milk.

.049 protien, .25 carbohydrates, .019 fat in 5 per cent milk.

.051 protein, .27 carbohydrates, .021 fat in 5 per cent milk.

The table which I have here and which can be easily obtained by anyone gives the digestible number of pounds of the different nutriments in one hundred pounds of many kinds of both concentrates and roughage. Knowing the weight of a cow in normal condition, a ration that will maintain this condition should be given. Then knowing the maximum quantity of milk the cow will give per day and the per cent of fat it contains, a ration can be figured out which will produce this milk in the most economical manner. Palatability must also be taken into consideration. A feed may be ever so scientifically compounded, but unless it is palatable and relished by the cows it will not produce results.

To the average dairyman, we will say that for good sized cows forty pounds of ensilage given in two feeds, night and morning, and all the clover hay they will eat and one pound of ground feed composed of corn, oats and bran, equal parts by weight for each three or three and one-half pounds of milk, feeding the cow up to her limit on that rate will give profitable results. Cottonseed meal or other concentrates can be substituted for the oats and bran feeding the grain mixture on the ensilage. In this way a cow will be fed all she will need to do her best and give the greatest amount of milk at the least cost. Dairymen consult your own interest. Read all the best dairy papers, dairy bulletins, study the cow, her likes and dislikes, study the feed question and aim to produce as much of it as is possible on the farm, buying as little as is necessary to properly

balance the ration in the ratio of 1 to 6.5. With selected cows and a ration as outlined above, with good care and surroundings, regularity in all your work with the cows, and a good market for the milk or the butter or cheese made, you will find the dairy the most profitable line on the farm. I thank you, gentlemen.

Chairman: Are there any particular questions you would like to ask? We have only a few moments for questions.

Member: Have you had any experience with a milking machine?

Mr. Julian: I was managing a dairy at one time and we put in a milking machine. At the time I took the management they were making a small quantity compared with the large number of cows they had. I made considerable change and by different methods I increased the quantity of milk. In two weeks we made more than 50 per cent increase, and then the company wanted to put in a machine, so I told them to send up and get a man and let him put a machine in if they thought it would give us better results. I feed those cows well. They got this man down and he said he wanted to see those cows fed, and after he watched me a day or two he said he could not make any improvement, but that he would try the machine. I told him I wanted him to take charge and I would turn over all the men to him. He worked for thirty days; the milk kept going down badly. Then we decided to milk by hand. The machine was an old one. The teat cups had more suction than they ought to have had and we would draw pure blood; so then we worked by hand a while; then decided to try the machine again, but it worked worse than ever and then we worked by hand all winter.

I have a neighbor who put in a B. & L. K. machine and while he reports success, his dairy has never paid. He does not run the farm himself; he does it by proxy and while his men milk he is in bed. He has a millionaire father who settles the accounts. I had another neighbor who had a milking machine, but he did not seem to use it, so I said one day: "John, why

don't you use that machine?" He said, "We do not have many cows and we do not want to bother." I said, "Didn't you take that machine off your cows?" He said, "Don't tell it aloud, but I do not want to ruin any company." A milking machine, so far as I know, is not a success. I will say, for young heifers, if you start it in, it is all right, but an old cow is like an old man—he can't be taught new tricks.

Mr. Mason: How much do you pay a man?

Mr. Julian: I do not keep a man to milk. My son and I do the milking; at least my son helps me when his mother thinks it is time for him to get up, she calls him. Sometimes I have eighteen milked before he starts in. I have no complaint to make for it would do me no good. I commence to milk the same time in the evening as I do in the morning. Out in that country I know men who work until sundown ploughing corn and then milk their cows after that; that is, require their help to do that. Do you blame a man for kicking? I believe I would kick the boss. There is no reason why a man should work all day, then expect him to work after dark. Some old men say they want to milk at night after the flies are gone. Some of my neighbors kick because I quit early. I keep a hired man part of the time. I do not milk as many in winter as I do in summer. I do not ask the hired man to milk. He works until 6:00 o'clock and then quits. All I expect him to do after supper is to go out and take care of those cows.

I take fifteen daily and weekly papers. Do you think those hired men will read any of them? Not much! They go over town and stay until 12:00 o'clock. If I say a word he is gone and that is all there is to it.

Chairman: Illinois has acquired some property we are proud of. We feel that we have a new man, and we are going to hang on to him. We feel that he is a son of Illinois and that he will try to make us wake up and learn a few things. Dr. Peters, I hope, will remain with us for several years. I take pleasure in introducing Dr. Peters.

ABORTION

by

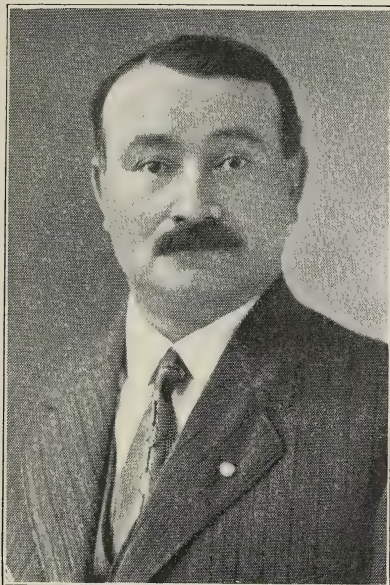
Dr. A. T. Peters, State Board of Live Stock Commissioners,
Springfield, Illinois.

This disease is by no means new. It has been reported many years ago and the theories regarding this disease are numerous. Some of the best Pathologists have posted themselves with the investigation of this disease. From time to time commissions have been appointed by Agricultural Societies of the different countries to study the breeding of live stock, and the infectiousness and cause and cure of this disease. Very little can be learned from the early writers. In fact, the early literature on this subject has a tendency towards superstition, in that it invariably attributed the cause of epidemic abortion to that of sympathy, that the animal is endowed with instinct to know that when one or more animals are so affected and that the odor or some other

mysterious omen would cause the animals to abort. The next was that abortion was caused through bad feed, especially moldy grain. Investigation has shown that this is only possible in rare instances. It was not until 1885 when Nocard, who had then undertaken the investigation of the disease, clearly pointed to the contagiousness of this affection. He was the first to study carefully the exudate from affected animals to discover, if possible, the true and exciting cause. From that time we attributed the cause of this disease to the discharge of aborting cows, this discharge being carried on the straw and litter to the other animals, which to a certain extent is true.

It was in 1897 that Bang verified the idea that this disease is contagious and demonstrated how this bacilli could be cultivated on artificial media and described this organism in detail. It was also through Bang's investigations that the real cause of this disease was discovered and that a large portion of this was due to the male. Heretofore the experiments had been exclusively made on the female by using strong disinfectants both internally and externally, thereby hoping to eradicate the disease, but it was found that by the most painstaking aseptic methods abortion could not be prevented. Prof. Bang called attention to the male and now by a combination of disinfecting the male and the female, good results are obtained.

Accidental Abortion. In dealing with abortion it should be first ascertained if it is of a noncontagious character. This abortion may be due to a number of different causes; through fright, spoiled food, violent purgation, injuries, through bad treatment by an illtempered attendant, slipping on the ice, etc. One may enumerate a number of things that may cause this trouble but suffice it to say that when one cow aborts the owner should be very careful to look into the details and to ascertain whether it occurred through an accident or whether it is contagious abortion. It is far better to be cautious and advise the owner to use the necessary precautions which are prescribed under contagious abortion. It is better to start the treatment early than too late. It has been the writer's experience that it is best to take this precaution.



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Secretary Business Men's League
Vandalia, Ill.

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Contagious Abortion. If considerable number of cows in a herd have aborted within a certain season or if the same cows have aborted in two or more successive seasons, if this disease has the tendency to spread to the other cows and especially if there is a history that the neighboring herds are affected with contagious abortion, then there is little doubt but what one is dealing with contagious abortion. It is important to know if any new stock has been added to the herd, for in a large percent the herds have been affected through this channel. Proof was not always conclusive that the cow that aborted came from an affected herd, but it is true that cows brought into a herd very often abort, even when there has not been a case of abortion in the herd from which it came. This is not a case of contagious abortion but it can so affect a herd if drastic measures are not pursued. This is one of the points that should be carefully guarded against.

Symptoms. The symptoms of this disease are not plainly visible in the early stages, but when one examines a number of cows in a herd where abortion exists and the vagina is carefully studied you will find that the mucous membrane is somewhat reddened and that it has a very slight elevation on which there is a peculiar eruption. This eruption may escape the eye that is not thoroughly trained, as it is not very prominent. From aborting cows there is usually a slimy, flocky discharge. The cow may be restless for three or four hours before the expulsion of the young. In some instances the cow shows symptoms for a day or two by the udder filling up and the lips of the vulva and vagina thickening, showing the signs of natural gestation. This is accompanied by nervous excitement. Where cows carry their foetus for five to seven months the usual symptoms are the swollen condition of the vulva and later on entire laxation. In addition to these symptoms there may be a free flowing of exudate as the symptoms increase this becomes more copious and may be streaked with blood. When these symptoms appear the expulsion of the young is near at hand.

The Cause. There is no question but what this disease is caused by a germ which has been described by Nocard and Bang. This germ cannot be killed very readily and on account of it being in the discharge from the vagina and also on the male animal it is important that the stalls and floors be thoroughly disinfected and that the bedding which may have been contaminated be burned and also the foetus. Cows affected should be isolated and should have one attendant who does not take care or come in contact with the healthy cows. It is important that one person be assigned to the affected herd and use the necessary precautions so that he does not walk into the stables where healthy cows are kept. Before he leaves the infected herd he should thoroughly disinfect himself and leave the infected garments in a suitable place so that they can do no harm. If a cow aborts in the main stable she should be immediately removed and the premises should be as carefully disinfected as possible, using a strong lye solution with plenty of hot water and a five percent solution of carbolic acid. The most painstaking disinfection should be at once commenced. The animal in the quarantine pen should be treated immediately as follows: If the afterbirth has not come away within five to eight hours it should be taken away by one who knows how to perform this operation. The animal should then be irrigated with a two percent solution of permanganate of potash and the limbs and tail, etc., should be washed with soap and water, and then with this permanganate of potash solution. One capsule containing oil and kreso is then placed into the vagina which dissolves and disinfects the vagina. The vagina should be irrigated every day with this permanganate of potash solution and a capsule inserted. In addition to this the cow should be fed carbolic acid in the feed. The carbolic acid should be prepared as follows: Crude carbolic acid is liquified and a small amount of glycerine is added to this to keep it in liquid form. You start in by mixing with the bran, two drams of this solution and then gradually increase the dose until about 6 drams have been given a day. This is increased according to the virulence of the disease. Best results have been obtained by giving

large doses to cattle where the percent of loss was very great. We have the best of success with this treatment. Eighty-one out of 211 herds treated reported good results.

The bull is probably the carrier of the infection, and therefore the bull should be thoroughly disinfected before and after service, with some antiseptic solution, as a tablespoonful of permanganate of potash to a pailful of water. A rubber tube can be used large enough to slip into the sheath of the bull, a funnel is fitted to the other end and when elevated will force the solution well into the sheath and with the hand the operator can work the solution thoroughly to all parts of the sheath. The limbs of the bull should also be sponged with a good antiseptic solution.

Sterility. Sterility is one of the sequels of contagious abortion. The reason for this is that the microbes enter the follipian tubes and affect and eventually destroy the ovaries and therefore conception cannot occur. Many treatments have been used for this affection and there are a great many patent medicines on the market to be used for this disease, but our investigations have shown that medicinal treatment has little or no effect. Out of 209 animals that were apparently sterile 86 remained sterile in the herd for a year or more, 41 for eighteen months or more, while conception occurred in 11 and successfully gave birth to a calf. Post mortems were held on 74 of these animals and all were found to have diseased ovaries; 42 out of the 74 had one ovary affected while 32 had both ovaries affected. It is interesting to know that the owners of these animals used the following remedies: Such as dilation of the os uteri, washing them with sterilized alkaline water, using yeast treatment and the various patent medicines offered for the cure of this disease. We lost trace of 135 of these animals, but this experiment shows that these remedies are of little avail when we have a record of 100 percent on which we held post mortems to have diseased ovaries, especially if the animal has aborted. The animals should be fattened as soon as possible and sold on the market.

Conclusions. Abortion in cattle is caused by a germ which is found in the exudate of the female and the bull. Therefore

cows should be thoroughly disinfected before and after breeding and also the bull. Newly purchased cows should be kept in quarantine and should be washed with an antiseptic solution. A cow that has aborted should be immediately placed in quarantine and an attendant should take care of these animals and avoid coming in contact with healthy animals. The bull should be disinfected before and immediately after each service. Cows should not be allowed to calve in the presence of other animals.

Member: What per cent of carbolic acid do you use in feeding the cows?

Dr. Peters: We use the crude carbolic acid mixed so that it is liquid. We start in with two drams per day until we have gotten to about four drams per day; in some bad cases we have given sixteen drams per day.

Member: How long do you have to keep that up?

Dr. Peters: That depends entirely upon the percentage of loss in the herd; in some herds we have had to keep it up three or four months. If you are obliged to do that I would advise you to purchase the carbolic acid in quite a quantity at a cheaper rate.

Mr. Mason: Our experiments have shown that we can give large quantities of carbolic acid without injury. I have made extensive experiments. The Dairy Department turned over to me some old cows that they thought would not amount to anything. Among them was an old bull. Professor Haecker said he would have to give him three doses, then he took him away because he looked so well, and sold him. We fed him for months on carbolic acid.

Member: How long do you recommend feeding a cow carbolic acid?

Dr. Peters: The ordinary dose that could be kept up for months is the two dram doses. I want to tell you that if you have a cow that is not in good condition and you want her to have that glossy appearance, you just start her on a two dram dose of carbolic acid.

The reason that I took up this investigation was that I read of carbolic acid in our agricultural addresses and it was important to know what carbolic acid would do. It was apparent to me that the doses recommended there were absolutely so small that they would not do any good unless you believed that homeopathic doses would do any good. That started this investigation.

Member: Do you dilute the carbolic acid with water?

Dr. Peters: Yes, you must use some water or it would burn.

Member: Does it have any effect on the milk?

Dr. Peters: Not unless you are careless with the carbolic acid. We tried it on some of the dairy herd that were not giving a large amount of milk and Professor Haecker turned over to our Department six head. We gave them the carbolic acid to see if it would taste in the milk. We kept them on that experiment for six months and this milk was sold separate in the city. I wondered if any of the patrons would report any taste, and no report was made so we concluded there was no taste.

Mr. Newman: The hog serum is sent to the farmers with the request that the veterinary assist in the work so that we have a record and we hold him responsible for that record. It is injected under the skin, under the thigh. I have here a few bulletins on hog cholera, and I would be glad to have you take them home with you.

Member: How do you give the carbolic acid if they will not take it?

Dr. Peters: I have not found any cow that would not take this carbolic acid in the food.

Member: Is not a cow affected with tuberculosis more likely to abort than one that is healthy?

Dr. Peters: That is not true as a rule. I do not think that the feeding means much to them. What I mean by that, not only that you should know precisely the amount they are fed, but you should bring up any of their offspring, feed them so that they can grow without any set back. They must have a fine circulation that can withstand the onslaught of disease.

Let me illustrate: You know that certain farmers, take for instance the farmers that are fattening chickens for the market, will purchase your chickens and place them in an enclosure and feed them certain rations. They are feeding them for that fine mellow white meat only. The result is that when these chickens are killed and being packed their bones are so soft they will break. Those chickens must be soft and they cannot withstand disease.

We have tried experiments with hogs. You know in hogs you want to grow a vigorous bone and you are probably aware that if you will feed them a certain amount of cotton seed oil you can increase their weight from seven hundred to twelve hundred pounds. This same thing is true of the cow, with certain food you can increase her weight from twenty-two hundred to twenty-four hundred pounds.

The average hog in Nebraska is fed on a large amount of corn. I believe very strongly in the feeding of certain minerals to make strong vigorous bone so as to ward off disease.

DAIRYING FOR PROFIT.

By

N. P. Hull, Diamondale, Mich.

Chairman: I am glad to have Dr. Peters with us and we certainly are fortunate in this state to have secured so able a man as Dr. Peters.

We have digressed from the beginning of the meeting. Dr. Peters' name should have appeared this afternoon. I will ask Mr. Hull to speak to us in a few minutes but before I call on Mr. Hull I would like to ask the nominating committee composed of Messrs. J. B. Newman, Austin and Charles Gilkerson, of which Mr. Newman is Chairman, to meet in Room 3 after the adjournment of this meeting. Please do not go, the good is yet to come you know. Any one having any suggestions to submit to that committee will please do so.

Mr. Hull needs no introduction to you, you have heard him many times with great pleasure. He was with us last year and has been for a number of years. I take great pleasure in introducing Mr. Hull of Diamondale, Michigan, and when he gets through just burn him up with questions and he will deliver the goods.

Mr. Hull: Mr. Chairman, Ladies and Gentlemen: I know just how hard these chairs have gotten to be because I have been sitting in one myself and I know you are all tired. I am perfectly willing now you should drop off to sleep if you feel like it. I have just one request to make and that is that you do not snore, it might interfere with your neighbor who wants to sleep.

Laugh and the world laughs with you,
Weep and you weep alone;
Sleep and the world sleeps with you,
Snore and you snore alone.

I am not going to talk a great while today because it is getting late and I know you are getting tired.

This reminds me of a story and I cannot remember whether I ever told it to you before or not, but I am going to tell it just the same. One fellow met an old school mate of his that he had not seen for a long time and he said :

"Hello Jack, how are you, married yet?"

"Yes."

"That is pretty good."

"But she has an awful temper."

"That is pretty bad."

"But she has a lot of money."

"Pretty good."

"But she put the money in a flock of sheep."

"That is pretty good."

"They died."

"That is pretty bad."

"But the pelts sold well."

"That is pretty good."

"She put the money into a house and the house burnt up."

"That is pretty bad."

"But she burned up with it."

I don't want you to feel that way toward me this afternoon. First, Mr. President, I want to say a word about an affair of my own. Over at the National Dairy Show at the Farmers' meeting the room was only about a fourth full; but when it came to the National Creamery Buttermakers' meeting the room was about full. Now it occurred to me and also to a great many of the dairy farmers present, if there were any class of people connected with dairying that needs inspiration, it was the dairy farmers, and I am sure that you will all agree with me that we ought to have some sort of an organization of the dairy farmers; that you ought to have representatives from your state; that we should send representatives from Michigan, and all these other states should send representatives so that we might have a general assembly held for united action; so there was a resolution presented

there and adopted that we organize and we concluded to call it the American Farmers' Association. That Association was unlucky enough to have a poor president, I am the poor fellow. I did not want you to cheer, I did not want you to agree with me. However, that cannot be helped now for one year. We concluded to have for our Directors prominent dairymen such as Mr. Frazier and Mr. Hills scattered all over the United States. We also concluded to ask the President of every Dairy Association in the United States and Canada to appoint ten delegates that will be present at the next dairy show.

I spoke in Vermont a short time ago and they appointed representatives there. At St. Louis last week they appointed theirs. I was in New Hampshire last week and they promised to appoint their delegates, and I am sure my good friend Mr. Wiggins will co-operate with us and appoint ten delegates to meet with us. I would like to talk longer on this subject but I must not.

I am to talk about Dairying for Profit. Now I suppose there are a lot of fellows who like dairying so well that they keep cows and milk them just because they love the business. I like cows, but it always occurred to me that there was always just as much fun in caring for those that paid a profit. I am fortunate this afternoon in having the gentlemen who have preceded me give you good talks along that line.

Then another thing, I have been to your Associations for four years and I have felt I ought not to say the same thing, so I have been looking over last year's report to see what I said to you at that time. I remember the President was not there, the Vice-President was in the chair and he turned me loose for the whole afternoon, so I am a little handicapped not to repeat what I said last year or to talk too much on the same line as these gentlemen who preceded me.

I take it for granted that every man that is putting in his time wants to get as much as he possibly can out of it. We are setting aside a part of our time, which is a part of our life in this great struggle to surround ourselves and our families with the better things of life, to educate our children and to provide for

old age, and if you and I get the most out of our life we have got to follow along certain lines. If we make our lives of the most value to ourselves and our families, while we talk about money being the root of all evil, we do need it in our lives. We want pleasant surroundings that we may be able to give those boys and girls better conditions, better education to broaden their lives, and it requires a certain amount of this world's goods to do that thing, and it is a duty that each one owes to himself that he shall provide against the day of sickness, and if we do it in the dairy business we must do it from the profit, and the profit in your business, my farmer friends, means exactly the same thing as in any other man's business.

Profit is the difference between what it costs us to produce and what we sell those products for. Every man ought to keep two propositions in sight, and I want to state those, if you do not agree with me let me know. I want you all to start with me. I maintain that the first thing is that we all want to sell as many dollars worth off our farm as we can that will carry with it the largest amount of profit.

The second thing is that we want to maintain or increase the fertility of our soil so that we may go on each year selling more dollars worth. Does any one take issue with me on that? It might seem that some men would because I have been traveling up and down this state, as well as my own and adjoining states because it seems that some men have no record for this thing.

We hear about keeping the boys on the farm. I have a boy in my home, and it is my ambition that that boy shall stay on that farm. I want him to think of it as a farm that his father and mother have put in their best endeavors to keep it. I want that boy to be a broad intelligent boy. I must persuade him that I have made a success of that farm and that I have been able to provide against my old age. You must persuade that boy that you are leaving that farm so that he can surround himself and family with some of the pleasant things of life. I am satisfied if we are to successfully maintain the fertility of our farms that we must adopt certain lines. Now I will admit that a man can use commercial fertilizer, but is there any man here that wants

to take issue that that is the best system? I do not believe there is.

What line of livestock are you going to adopt, you want to adopt that line that will pay you the best profit and that can build up the fertility of your farms. Let me make a comparison, take for instance the feed that you put in part of your time in growing, then you go feed it to a steer, sell that steer for dressed beef which is worth from 5 to 10 cents per pound. (It has been as low as 5 cents.) That steer will take that feed and convert it into beef that is worth 5 cents. The dairy cow will convert it into a pound of butter worth 35 cents. Dressed beef will sell for 10 cents; that means that the steer will convert it into one pound at 10 cents, but the cow will make you 35 cents. There is more work, it is true, but the difference in the cost of production is not commensurate.

I was doing Farmers' Institute work last winter. I had been talking along this line for I believe in dairying. I have been talking it for ten years. I did not know that the Secretary of that Institution was a beef man, but it made no difference. He came to me after the close of the meeting and said: "You are giving it to us steer feeders in the neck. I get \$60.00 a head for my steers, do you mean to say there is no profit in it? You say there is more profit in dairying." I said: "How much less do you feed those steers than I do my cows?" He said: "I feed them about as much, if I hadn't I could not have sold them for \$60.00." I said: "You are willing to agree that the feed costs the same; in the spring you sold them for \$60.00, all you have to show for it is the \$60.00." I said: "Let me tell you, with the same amount of feed I sold from each one of my cows \$100.00 of dairy products, and I have my cows yet." He said: "You had to milk your cows and I did not have to milk my steers." I said: "That is right but you had to keep those steers." I do not say that every man can go into the dairy business and make a success of it, but he can if he goes at it in the right way and loves his business. I want to convince you that dairying is profitable.

Now here is another illustration: When I was in debt, and I have been in debt up to my ears. My father died when I was

four years old, he left my mother, my brother and I to assume the indebtedness of that farm. We bought land until we had more land than anything else. I never laid awake nights thinking the interest would not come due and I never laid awake nights thinking the tax gatherer would not come around, but I did have to lay awake nights to know where the money was coming from to pay the interest and the tax gatherer! Death and taxes are mighty sure things and interest is next.

I looked about me to find some sort of a business that would be sure to bring in an income and I lighted upon dairying. Now let me ask you where can you find a line of business that will insure you as steady a cash income as dairying?

Let me make another comparison, we will take the hog. If I had hogs I would keep them until they are eight months old, and the thing to know is whether they are going to sell for enough to pay for their food and a profit besides. Just now there is a sure profit, but I have seen times when it was not so sure. Take it with a steer, many keep that steer two years, he will pay for it if he can, but supposing his carcass does not pay enough then you are bunkoed. I can draw pay twice a day from those dairy cows. Now my friends show me any business that you can draw pay twice a day. The nearest is the old hen, but there are mighty few that pay but once a day.

I told you I would not keep you too long. I must not talk any longer on this particular point. Dairying is a good profitable business if it is carried on as it should be, but it takes something besides keeping cows to make it a success. I know a lot of men that are keeping cows that are not making a profit, it takes something besides. I was glad to hear this testimony from Iowa that there are only a few men that make a good profit in dairying. I have traveled a great deal in Iowa, and for a great dairy state I think they have as large a percentage of poor dairy cows as I ever saw. They are willing to feed that steer calf, they are willing to get along and take \$30.00 less than to go into dairying. That is a mistake.

There are a lot of men who call themselves dairymen who are not making any money. I will have to tell you another

story. I presume I have told this story in Illinois. I want to impress upon you the fact that it takes something besides cows to be a successful dairyman. A fellow happened to board the same street car as I did. He looked for a place to sit down, there was no place, he took a strap, as long as it held it was all right. The road was not even, they struck a curve and the strap broke, he fell into a lady's lap. She was not from Illinois and consequently was angry about it. She gave him a push and looked up at him as cross as could be and said: "What kind of a man are you?" He said: "I supposed I was an Irishman but I guess I am a Laplander." Now there are a lot of fellows who are keeping cows that are just as mistaken. A lot call themselves dairy-men as that man called himself an Irishman.

I have been in the dairy business for several years, and what I am going to say to you about profitable dairying I know to be true. I have been in the cow stable and I know this to be true. That may sound chesty, then I have not only my experience but for ten years I have been running up and down the state of Michigan. I have attended sixty lectures in the state of Illinois on dairying and in the last year I think this makes ten different states where I have talked it, and I have met the best dairymen in those states, and I want to say their experience is along the same line as mine. It is backed up by experience, and every other man I have ever talked to that has made a success of dairying has had the same experience. If the experience of my friend from Iowa has been different from mine I would be glad to have him say so, but I am sure it has not been.

Now there are four essentials in good dairying, three really, and I want to tell you the three you must have and you cannot make a success of dairying without them.

First, you must have a good cow, that means a cow that will take a dollar's worth of feed and convert it into the largest amount of dairy product. I do not care whether she has the big black and white spots or whether she is a Guernsey. My opinion is there are a lot of good cows and I know there are a lot of poor ones. If you are going to get the most profit you want to get the best you can. What our friend Mr. Julian said was right, first

get a dairy breed, leave that old dual purpose cow out, you cannot make a success of it. Some cows have the natural ability and some have not to convert food into milk, others convert it into flesh. Now these dairy breeds have been bred for this purpose to convert food into milk instead of flesh. One fellow said he believed in short horned cows and spent a lot of money buying that kind. They had been crossed until they had nearly obliterated their milk supply. You can set this down as a fact if you want short horns, by proper feeding and proper care for a few generations you can get good milkers, but when you have done that you have taken away her beef properties. You take these so-called general purpose cows and you will not get good milkers.

Let me give you an illustration: At the last National Dairy Show Mr. Rabild had charge of this demonstration work. He asked me to come and help him with the work. We selected sixteen cows that freshened about the same time, this is to illustrate the difference in cows. We took these cows and fed them, we kept a large placard and put down the amount of milk each time, the cost of her feed, what she cost to produce a pound of butter fat and how much she returned for each pound of feed invested. Of the sixteen cows some averaged \$2.00, the poorest was 86 cents. Take that herd, and that herd could be called a representative herd, the conclusion would be fair and safe. Now the diagram showed that if we could take out the seven poorest cows and put in their place seven as good cows as we kept, in one year we would make as much as we would in two years with the present herd.

The average man who is keeping cows is putting in two years time for what he could accomplish in one year if he had good cows.

Then another thing the product must have proper care. I was in Ohio last spring, a man told me they thought they had the best dairy man anywhere around. I met that man. He showed me what he got from those cows. He said: "You do not believe it?" I said: "I did not dispute you." He said: "I want you to come out home with me." I said: "That is what I would like to do." I saw those cows and saw him milk those cows and

weigh the milk. I looked at his milk sheets. I was satisfied that he was telling the truth. Those cows paid him for twelve months \$160.14 a cow, his feed bills were \$55.00 a cow. That man showed me an example of profitable dairying.

How did he go at it? You can go home and do just the same thing and you will have gotten enough benefit from this meeting to pay you for attending a good many years. That man said: "I was working for a fellow that owned this farm." He said: "I want to sell you this farm." I told him I had only \$300.00 and I could not buy his farm. He said: "You have been working for me for two years, I will sell you this farm on contract." I finally consented, and this was twenty years ago.

That man has put on new buildings. He has in his barn tickets that will show you just what every cow gives. He started in with one cow and bred her with the best sire he could find. He keeps the heifers until he finds out just how much milk they give, if they are good they stay, if not, they had to get out. That man has paid for that farm and is today one of the prosperous men there.

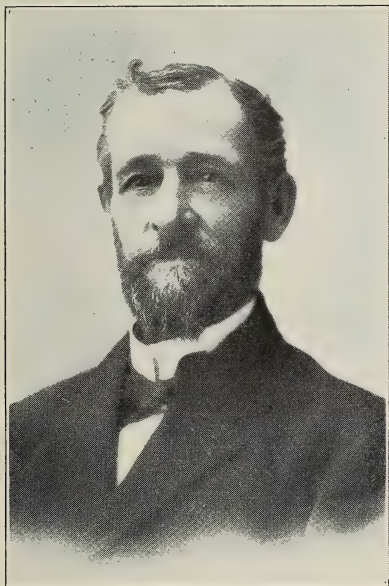
I am like Mr. Julian, I like the black and white cow, they look good to me. I am satisfied there are just as good Jerseys and Guernseys as there are Holsteins, the only thing is they fit into my work and I like that cow. I had thirty-nine black and white cows. One day I was standing with a friend of mine watching them go down the lane at 4:30 in the afternoon for their feed. I called my friend's attention to that row of cows, going along Indian file all black and white but one. I said: "I am very proud of those cows." He said: "They did look good, but why don't you sell that red cow." I said: "That red cow has returned me \$2.00 for every dollar she costs."

That is the first proposition, get a cow that will pay. You ask how do you know. Know what you are feeding the cow and know what the cow pays you, that does not require a great deal of time or work. We weigh just twice a month, the 1st and 15th, that does not take much time. We weigh the food every once in a while. We know what each one consumes, we know just how much that small measure contains, it is near enough for

all practical purposes. It is marked on her stall just how many measures she takes. Now when you know how much you are feeding her you will know the cost. Of course, as the system gets further along in her period of lactation, when it comes near the end of the year, you must keep the cow that has made you the most money.

Select the cow of that breed that you like best, then select the cows in that breed that can give you two dollars worth of profit for every dollar's worth of feed consumed. Give the cow palatable feed and keep everything clean about her. Just a word about palatable food, feed a cow what she likes, she will digest it better. You all ought to have silos, there are quite a number who do not. I presume some think it is quite a luxury, but I want to say to you a silo is not a luxury, it is a poor man's necessity, because there is no sort of building that you can build that will store so much feed, so the poorer you are the more you ought to build a silo, then again you can harvest your corn. I am not here to say anything against feeding corn from a bundle, but it is not the way to make the most profit in dairying. I can harvest my corn crop at 10 to 15 per cent less expense. Of course in Michigan we cannot afford to waste 40 per cent and let the stalks stand in the field as you do, and I am going to say you cannot afford to do it either. Then the next thing that corn, when it is cut and shocked and left in the field loses 35 to 50 per cent of the material value. When it is put into the silo it loses only from 5 to 8 per cent, and then the great thing is that the cows like it.

For six years I was in Michigan talking about silage each year. A man said to me: "I built a silo last year, and while my cows are giving more milk, they do not like it as well." I said: "What are you feeding them besides." He said: "I am not feeding them anything else." It is a good feed but you must use something else. Fresh pork is good, why don't you always have it. He could not do a good day's work on that one food alone, neither could a cow do it. I feed 35 to 40 pounds of silage, I feed clover hay, I feed them as great a variety as I can, then I give them two or three kinds of grain. You must have sweet



T. J. JULIAN,
Dairyman, Algona, Iowa.

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silage, not extremely sour. Put up a good silo, and then feed silage every day in the winter.

Have your cows freshen in the fall, cows well fed and with good care will give more pounds of milk than if freshened in the spring. Your cows will give the most milk when milk is the highest. You can feed those cows in winter on silage just as cheaply as you can feed them in the pasture in summer. You will find your hundred pounds of milk is worth more in winter than in summer, then again it takes the most time to milk, and then is when you have the most time. Then again next summer when you are the busiest, when the flies are the worst, when the product is cheapest, then your cows are dry.

You will find another thing, we have some difficulty in getting all the hired help we need on the farm, men have said they could not get the help. Before we were in the dairying business we hired men to work six or eight months, then they went somewhere else and promised to come back but they never did, now we keep him the year around. You can do it if you have a good herd and milk them in winter. If you have a good man keep him there just as long as he will stay. There is help enough this year, the fellow in the city is wondering how he can keep his family. The superintendent in the district said: "I can send you a hundred men in forty-eight hours; I never saw a time when there were so many that wanted to go onto the farm."

Mr. James Hill says that in 1917 we will be importers instead of exporters. We are going to see the greatest change in the next ten years that we have ever seen in any ten years. Get a good cow, then feed her regularly, feed her a variety of food and keep things clean about her, then you will be giving her a fair chance. There are a lot of cows who are not to blame. They have never been fed sufficient to enable them to make a profit. They do not feed her enough and do not give her the right kind of feed and do not keep her warm and healthy and comfortable.

This is wrong. I have talked this for the last ten years but I could go on and talk it for the next ten years, and then there could be a lot said about it. To get a cow to do her best work, she must be healthy, keep her comfortable, keep her warm.

A neighbor of mine says a cow could do just as well in a shed as in a barn, but this is not so. A fellow told me he turned his cows out and went to work, he said they needed exercise. I said: "Talk about exercise, don't you know a cow in giving milk exerts as much energy as a cow that ploughs two acres?" If you have a good cow, do not turn her out of doors. She will get exercise enough. You had better take the best possible care of her and let her use her machinery to elaborate milk. Keep her warm and feed her well and she will pay you, and there is no other animal that will pay the amount of profit she will.

Now I am sure I have talked as long as I ought to, but I do remember I told you I would not keep you too long. I want to thank you for the most excellent attention you have given me.

Chairman: Just one minute. I want to call your attention to the banquet at 6:30.

Now tomorrow morning we will open our exercises at 9:30 sharp. We will have a big meeting.

Adjourned until 9:30 Friday morning.

The Banquet

A pleasant and interesting feature of the Convention was the banquet given Thursday evening, Jan. 20, by The Vandalia Business League. J. G. Burnside, president of the League, was toastmaster. Addresses were made by a number of visiting dairymen and by members of the League. Music was furnished by Vandalia orchestra, Geo. L. Whiteman, director.

Friday Morning, January 21.

Butter Scores.

Chairman: I suppose after the party of last night you all slept well and we can go ahead with the meeting a little earlier than advertised.

Mr. Caven has the butter scores which he wishes to read.

Mr. Caven: All the scores have been completed except the scores on the milk and the judges are busy with the milk scores now.

In butter the highest score was 96 by Mr. George W. Hoppinsteadt. 96 is a very high score for butter made this time of the year. The second highest score was Mr. K. B. Carpenter of Mt. Carroll, the third highest was Mr. L. R. Weckerley of Dakota.

Creamery Butter.

	Score.
Lars Johnson, Stewardson, Ill.....	90
Louis Nielson, Camp Point, Ill.....	91
Geo. A. Cutler, Belvidere, Ill.....	92½
Geo. Bloyer, Harper, Ill.....	89
C. E. Mortenson, Milledgeville, Ill.....	88
E. T. Moore, Oakwood, Ill.....	89
H. L. Moore, Strasburg, Ill.....	91
C. A. Fields, Olney, Ill.....	88
Robt. Moren, Morrison, Ill.....	92½
P. H. Jacobson, Ridge Farm, Ill.....	94
Arthur Maule, Round Grove, Ill.....	92½
N. A. Peterson, Sigel, Ill.....	90

K. B. Carpenter, Mt. Carroll, Ill.....	95½
Wm. J. Kane, Thomson, Ill.....	93½
L. R. Weckerly, Dakota, Ill.....	94½
Ferdinand Grimm, Savanna, Ill.....	93
M. S. Martin, Port Byron, Ill.....	90
F. J. Weddige, Big Rock, Ill.....	91½
A. A. Adams, Harvard, Ill., R No. 1.....	93½
Geo. W. Hoppensteadt, Goodenow, Ill.....	96
Wm. Engelbrecht, Mt. Carroll, Ill.....	91
Frank McFarland, Big Rock, Ill.....	93
E. F. Harrison, Warren, Ill.....	89
C. E. Potter, Urbana, Ill.....	93½

Dairy Butter.

Geo. A. Shafer, Villa Grove, Ill.....	91½
E. J. Mattson, Morrison, Ill.....	90
A. R. Stickle, Macomb, Ill.....	92½
Mrs. W. M. Stanley, East Alton, Ill., R No. 2.....	91½
R. H. Pennington, Plainfield, Ill.....	90
Chas. Foss, Cedarville, Ill.....	94½
F. S. Morse, Ridgefield, Ill.....	91
J. C. Candle, Vernon, Ill.....	90
C. E. Cox, Vandalia, Ill.....	92
J. C. Causey, Vandalia, Ill., R No. 5.....	87
J. D. Ryan, Brownstown, Ill.....	91½
J. F. Turner, Brownstown, Ill.....	88
C. A. Cunningham, Vandalia, Ill., R No. 2.....	91½

Market Milk.

Prize Winners.

L. A. Spies, St. Jacob, Ill.....	First
J. C. Causey, Vandalia, Ill.....	Second
Lester Sturm, Vandalia, Ill.....	Third

Certified Milk.

L. A. Spies, St. Jacob, Ill.....	First
E. J. Mattson, Morrison, Ill.....	Second
J. F. Causey, Vandalia, Ill.....	Third

Market Cream.

Leland Hotel Farm, Springfield, Ill.....	First
C. E. Cox, Vandalia, Ill.....	Second
Lester Sturm, Vandalia, Ill.....	Third
J. F. Sammann, Havanna, Ill.....	Fourth

Butter Scoring.

K. B. Carpenter, Mt. Carroll, Ill.....	First
N. A. Peterson, Sigel, Ill.....	Second
R. J. Collier, Nokomis, Ill.....	Third
Chas. Foss, Cedarville, Ill.....	Fourth
E. T. Moore, Oakwood, Ill.....	Fifth
M. G. Hallgrove, Aviston, Ill.....	Sixth

Milk Testing Contest.

Louis Nielson, Camp Point, Ill.....	First
Chas. Feldes, Olney, Ill.....	Second
K. B. Carpenter, Mt. Carroll, Ill.....	Third
E. T. Moore, Oakwood, Ill.....	Fourth
R. J. Collier, Nokomis, Ill.....	Fifth
John Abisher, St. Jacob, Ill.....	} Tied for Sixth
T. H. Hussmann, Hoffman, Ill.....	

Resolutions Adopted.

Chairman: I will ask the Chairman of the Resolution Committee, Mr. Newman, to read the resolutions, it is a good time to take them up now.

Mr. Newman: Your Committee has worked on the Resolutions quite a little and have brought forth the following:

Tuberculosis.

WHEREAS, Bovine tuberculosis is a disease threatening the health of the human race, and is rapidly spreading among cattle and hogs supplying human food, and

WHEREAS, Dr. J. M. Wright is carrying on an active campaign to stem the tide of this disease and to safeguard the interests of the dairy farmer.

THEREFORE BE IT RESOLVED, That it is the sense of the Illinois State Dairymen's Association, in annual convention assembled, that the work of Dr. J. M. Wright in his efforts to protect the health of the human family against tuberculosis be endorsed, and that he be urged to continue to use every possible means within his power toward stamping out the disease and preserving the interests of Illinois Dairymen.

State Butterine Law.

WHEREAS, The Supreme Court of the State of Illinois has rendered a decision upholding the law preventing the artificial coloring of oleomargarine and butterine and the sale thereof in the State of Illinois,

BE IT RESOLVED, That the Illinois State Dairy Association, in annual convention assembled, hereby expresses its entire confidence in such law and the benefit that it will be to both the producer of creamery and dairy butter, and the consumer thereof, reaffirms its faith in the law and urges that officials

having its enforcement in charge use every honorable effort to secure the full and complete enforcement of such law, and

WHEREAS, The State Pure Food Commissioner executing the dairy laws is handicapped by the limited number of Inspectors allowed in this particular department,

RESOLVED, That the Legislature be asked in the next appropriation to increase the number of Inspectors to twenty, and to not limit the number of these that can be used in enforcing the dairy laws,

RESOLVED, Appreciating the compliment paid us by the Honorable Dairy Commissioner in appointing Mr. John B. Newman of Elgin as his assistant in charge of the Dairy Department, we reaffirm our confidence in him and will give him our hearty support to the end that the Dairy Laws of the State shall be enforced.

Animal Diseases.

WHEREAS, The Illinois State Board of Livestock Commissioners have been enabled, by public appropriation, to establish at Springfield a laboratory for the study of animal diseases, and under the direction of Honorable Philip Hanner, President of the Board, have secured the services of Dr. A. T. Peters;

BE IT RESOLVED, That the Illinois State Dairymen's Association, in annual convention assembled, heartily commend the establishment of this laboratory, and urge upon farmers the fullest possible support of this institution, feeling assured of its usefulness to the farmers of the state in combating the many diseases our stock is subjected to.

State Appropriations.

WHEREAS, The Illinois General Assembly appropriated Twenty-five Hundred Dollars per annum for the support of the Illinois State Dairymen's Association in distributing advanced dairy information, and

WHEREAS, The General Assembly also appropriated Fifteen Thousand Dollars per annum for the support of the

Dairy Department of the Illinois Experiment Station in carrying on much needed dairy investigations in this state, and the publication of its findings in bulletin form,

BE IT RESOLVED, That the Illinois State Dairymen's Association, in convention assembled, commend this action as making for the best interests of the people, the progress of dairying and the wealth of this state.

Thanks to Citizens.

WHEREAS, The citizens of the City of Vandalia have contributed largely to the success and entertainment of the 36th annual convention of the Illinois State Dairymen's Association,

BE IT RESOLVED, That this Association, in convention assembled, extend its thanks to the citizens of Vandalia for the prominent part they have taken in the success of the annual meeting of the Illinois State Dairymen's Association.

WHEREAS, While our meetings have been a success at Vandalia, we have missed that patriarchal face and cheering song of our old friend, "Jules Lombard";

THEREFORE BE IT RESOLVED, This Association, recognizing the power, strength and help he has been to us in the past, send him through our Secretary, our heartfelt sympathy, love and best wishes for his speedy recovery.

Advisory Committee.

WHEREAS, The State Advisory Committee of the Illinois State Dairymen's Association have been enabled to work in the utmost harmony with the Dairy Department of the Illinois Experiment Station, and has aided in directing the energies of the dairy investigations of the State Experiment Station along lines of scientific and practical interest,

BE IT RESOLVED, That the Illinois State Dairymen's Association, in annual convention assembled, reaffirms its confidence in the usefulness of this committee, the value of its services to the State Experiment Station and the dairy interests of the State of Illinois.

Oleomargarine Law.

WHEREAS, There is an active campaign on the way in Congress to amend the Grout law by reducing a ten cent per pound tax on oleomargarine and butterine colored in imitation of butter, and the one-quarter a cent per pound tax on uncolored oleomargarine and butterine, and

WHEREAS, Such tax is necessary for the protection of legitimate dairy and creamery butter against fraud and deceit, and the unjust competition of bogus butter;

BE IT RESOLVED, By the Illinois State Dairymen's Association, in annual convention assembled, that all efforts being made in or out of Congress to reduce the tax on oleomargarine and butterine be condemned and that the representatives of Illinois in the House of Representatives at Washington and the Senators in the United States Senate be urged to use all honorable means to defeat any and every attempt to appeal or abridge the Grout law.

State Fair Exhibits.

WHEREAS, Superintendent A. N. Auten and Assistant Superintendent C. Gilkerson have been enabled to make changes in the Dairy Department at the State Fair that have increased the usefulness of exhibits to spectators and the general educational value of the show;

BE IT RESOLVED, That the thanks of this Association in annual convention assembled, be extended to the Illinois State Board of Agriculture, and that every effort be made to aid Superintendent Auten and Assistant Superintendent Gilkerson in their efforts to raise the standard of the Dairy Exhibit at the State Fair in quality and quantity, and furthermore that dairymen, creamery men and cheese makers be urged to support the show by making entries of their products.

Cow Testing Associations.

WHEREAS, At least twenty-five per cent of the dairy cows in Illinois are naturally unsuited to become profitable producers of dairy products, and are fed at a loss, and

WHEREAS, There are few economical methods of testing the efficiency of the individual cow in the farmer's hands, and as the cow testing associations furnish the necessary means for economical and accurate work,

BE IT RESOLVED, That the Illinois State Dairymen's Association, in annual convention assembled, does hereby endorse the Cow Testing Association and urges the establishment of these associations throughout Illinois as rapidly as possible.

Respectfully submitted,

Joseph Newman,

C. P. Reynolds,

Geo. Caven,

Committee.

These resolutions were unanimously adopted.

Election of Officers.

Chairman: The election of officers is next in order. Mr. Joseph Newman is Chairman of the Nominating Committee. Mr. Caven, will you take the chair please.

Mr. J. Newman: I beg leave to report the following names: President, Mr. L. N. Wiggins of Springfield; for Vice President, Mr. Joseph Newman of Elgin; Directors, E. Sudendorf, Clinton; J. P. Mason, Elgin; C. T. Gilkerson, Marengo, and John Lynch, Olney; for Treasurer, A. F. Jensen, Effingham, and for Secretary, Geo. Caven, Chicago.

Chairman: Gentlemen, you have heard the report. What is your pleasure?

It was moved and seconded that the gentlemen named by the Committee be unanimously elected for the ensuing year.

Mr. Newman: I would like to make a suggestion, I think it wiser to put a younger man in for your Vice-President.

Mr. Caven: If Mr. Newman will give me that list and Mr. Wiggins will take the chair I will cast the ballot.

Chairman: Mr. Newman puts it on the ground that he is an old man and should be excused. He has not acted like an old man around some of these conventions. However, I feel that I am a younger man than some of you here and have had the honor of this office for some years, and I had hoped that the Committee would see fit to put some one else in this office which they have kindly honored me with again.

It has been four or five years that I have endeavored to fill the chair and get these meetings together but I have always been ably assisted. It is a great honor and I appreciate it and want to thank you, and all I can say if you will look over the short com-

ings of the past year or two or three that I will make an honest endeavor to promote the interests of this Association and to do my best in the coming year, and by that time I hope some one else will be ready for the chair.

We feel that the State Dairy Association reaches every part of the State and every County and every Township, and everywhere we have friends and supporters. The whole strength and efficiency depends entirely upon the individuals. It is gratifying that the meetings have been largely attended for we all know that it is hard for the man behind the cow to get away. I hope that some day we can show these men that if they can get away it will be better for them; as yet we are on the campaign of education, and it will take some time to make many see how it will be to their advantage to attend these meetings.

I want to ask you all here to particularly feel that as long as you are members of this Association that your officers are always glad of suggestions. It does not take long to write a letter to one of us and make suggestions of what you think we ought to do and how we should proceed. It is hard to know just how we ought to go after things, and the hearty support of every one interested in the cow will do more for this Association than any number of officers you might select.

I wish to again thank you for the honor conferred upon me. I wish to thank the newspaper and the supply men, they are a crowd of good fellows, and a great many come every year and have to swallow the same doses and they are not homeopathic either. I want to impress upon them the necessity of spreading the dairy gospel.

Mr. Caven: In line with what President Wiggins has said, I just want to mention another little matter, and that is our auxiliary meetings. The last three or four years we have had meetings at different places, and with very good results, and I hope we can have another meeting in the early part of March; the only requirement is that some one in the locality where the meeting is held will take hold and work the sentiment. The Association is perfectly willing to supply the speakers and pay the expenses. The business of the local man is simply to provide a place and

to advertise the meetings in his community and try to get out a crowd. These one day meetings have produced excellent results and we can hold a few this spring, and if any of you wish one of these meetings in your community and will notify me and agree to make the arrangements, you can doubtless arrange to hold such a meeting.

Chairman: We have had to change the order of the program again, and it seems a good time now to have some one tell us about the Practical and Profitable Dairy Methods. A man that can get a $94\frac{1}{2}$ score at this time of the year ought to be able to tell us something about dairying. I take pleasure in introducing Mr. Foss of Cedarville.

PROFITABLE DAIRYING IN ILLINOIS.

By

Chas. Foss, Cedarville.

Mr. Foss: Mr. Chairman, Ladies and Gentlemen: I want to talk to you this morning along the line of Profitable Dairying in the State of Illinois; that is I want to talk to you about the possibilities. If I am not mistaken Mr. Rabild said the average production per cow was 142 pounds; the Dairy Union has found that the average one-fourth of the cows of Illinois do not pay for their feed. Now I believe that the figures, especially by the Dairy Department are too high. I will tell you why. It is absolutely impossible for the Dairy Department to get these men who have the poorest cows to do any testing; the herds we have tested are above the average, therefore, I think I am right to state that one-half of the cows in the State of Illinois do not pay for their board. They do not pay enough profit to keep them. I am not here this morning to give you a whole lot of theory, what I am going to talk about are actual facts.

I began at the bottom of the dairy business ten years ago. I left the school room and began dairying. In the northern part of Illinois thirty years ago they kept a few cows for their own use, then the creamery came in but it was a side issue. The creameries where I live have ceased to exist and the cheese factories have come in to take their place. The famous Blue Label Cheese is to this locality what the creamery business is to Elgin. These cheese factories do not run in the winter.

When I began on the farm I kept cows just like my neighbors, but I have taught arithmetic too long in the school room to feel satisfied that I was getting enough out of my cows. The second year I listened to Mr. Glover and heard him tell of the vast difference in cows, and I had not listened to Mr. Glover more than a half hour before I saw the key to the situation. I saw the thing I ought to do was to keep a record, sell off the

poor cows and keep the good cows. I asked Mr. Glover if he would not test my cows. He said: "I have more than I can handle but I have an assistant and I hope he will be able to get around and test your cows." I did not hear anything more until the next fall when he said he would come. What I want to give you this morning are some actual facts, tell you what I have started and what I have done in six years. There is not a man here who cannot do just as well as I did if he applies himself. I want to give you some figures, I am not going to tell you anything that I cannot substantiate. I have lived here for ten years, the first four years I did not keep a record, but I did keep track of the milk checks. Up to six years ago I had all of the milk checks, then I transferred those accounts into a book.

There is certainly a vast difference between keeping a cow at a loss and keeping one at a profit of \$30.00. But why do we keep a cow that does not produce a profit at all? Simply because we cannot always distinguish the poor cow from the good one. Too many dairymen are content if their herds return a small profit while, if they would see the low producers, the profits of the herd would be materially increased. We have too many poor cows in our herds who are consuming the profits of the good cows and thereby reducing the profits of the entire herd. It is possible that all of the cows in Illinois be made to yield a profit of \$30.00 per cow instead of only one-fourth of them. This may seem too high to be reached by all the dairymen of Illinois, but it can be done if only the dairymen will wake up to the situation.

In order to accomplish this we must weed out the poor cows. Feed the good cows a balanced ration, and breed for better cows by heading our herds with the best sires obtainable.

How can we detect the poor cow in our herds? Is it possible to distinguish a good cow from a poor one by outward appearances? Not always. There is but one absolutely reliable way and that is by using the scales and the Babcock test. A pair of scales, some half pint bottles, some corrosive sublimate tablets for preserving the samples, and some milk sheets do not cost much, and if properly used will return many times their cost in



N. P. HULL,

Assistant Dairy and Food Commis-
sioner, Diamondale, Mich.

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a year. You will then be able to distinguish the poor cows from the good ones. I have been testing my herd and keeping an individual record of each cow for over five years.

Before I tested my herd I averaged \$30.00 per cow per year for butter fat at the creamery. I was quite sure I was not receiving as much from my herd as they cost me to keep them, or at least was not making any profit. In December, 1903, I began testing my herd and have been testing them continuously ever since.

The first year I tested my herd of fourteen cows averaged 5,800 pounds of milk and 224 pounds of fat. The lowest cow produced 3,321 pounds of milk and 151 pounds of fat, while the best cow produced 9,802 pounds of milk and 386 pounds of fat, a difference of 6,481 pounds of milk and 235 pounds of fat. Six of the fourteen cows I had produced less than 200 pounds.

The lowest seven cows averaged 179 pounds fat and 4,825 pounds milk, and the highest seven averaged 269 pounds fat and 7,128 pounds milk, a difference of 2,303 pounds milk and 90 pounds fat.

One of the surprises at the close of this year's test was the great difference in the production of cows, Nos. 6 and 7. These cows stood side by side in the barn. Both received approximately the same amount of feed, and I had always considered both of them excellent cows. Cow No. 6 produced 9,802 pounds of milk containing 386 pounds fat. No. 7 produced 4,701 pounds milk containing 176 pounds fat, a difference of 5,101 pounds of milk and 210 pounds of fat. The one produced \$3.00 for every dollar's worth of feed consumed, the other \$1.40.

No. 6 was a high grade Holstein; the other was a grade shorthorn cow of the dual purpose kind. No. 7 was a beautiful looking cow, having an exceptionally large pendulous udder, but not very large milk veins. Cow No. 6 returned a little more than five times as much net profit in a year as No. 7. A small herd of ten cows like No. 6 will return as much net profit in a year as a herd of 53 cows like No. 7.

This is not all of the difference in these cows. Think of the difference in the cost of building and keeping in repair a barn for

the ten cows and a barn for fifty-three cows, and the difference in the labor required to feed and milk these two herds. One way for the dairyman to solve the labor problem is to sell his poor cows to the butcher and keep all good cows but less in number. Another cow that I had considered a low producer and had at one time thought of selling, produced 5,970 pounds of milk containing 272 pounds fat. Her milk averaged 4.55 per cent fat. This cow returned \$2.25 for each dollar's worth of feed consumed. This only shows how unable we are to distinguish the poor cow from the good one without using the scales and Babcock test.

At the close of the first year's test I sold three of the lowest producing cows. I changed from a summer dairy to an all year dairy. I began to read Hoard's Dairyman, and I also began studying how to feed a cow a balanced ration. I consulted with the Dairy Department of the University of Illinois and received much valuable information from same.

I sent to both Washington and Urbana for bulletins along dairy lines. The increase in the production of my herd is due to feeding a balanced ration, as well as to weeding out the poor cows and heading the herd with a pure blood sire.

I bought two new cows that produced 298 pounds and 317 pounds of fat respectively.

At the close of the second year's test the herd averaged 7,150 pounds milk and 260 pounds fat, an increase of 1,305 pounds milk and 36 pounds fat per cow over the previous year. Only one cow produced less than 200 pounds of fat. The lowest one-half of the herd produced 223 pounds fat, within one pound of the average of the whole herd of the previous year, and the highest one-half produced 298 pounds fat per cow, still showing a difference of 75 pounds fat per cow between the two halves of the herd.

Two of the lowest producers were again sold and one new cow bought, and three heifers that had been raised were added. The cow that was purchased proved to be a good one producing 6,669 pounds milk containing 277 pounds fat. Of the three

heifers added two proved to be exceptionally good ones, one producing 7,889 pounds milk and 303 pounds fat, the other producing 8,607 pounds milk and 295 pounds fat. One of these heifers was a registered Holstein, the other one was a high grade Holstein, whose sire was a pure bred Holstein and her dam was cow No. 1, a grade Holstein, having a record of 5,970 pounds milk containing 272 pounds fat. These two heifers produced an average of 29 pounds fat more than the average of the herd the previous year and one pound fat more than the highest one-half of the herd. These heifers are now mature cows and have produced 9,999 pounds of milk and 348 pounds of fat and 8,929 pounds of milk and 361 pounds of fat respectively in twelve months. Both of these cows are returning more than two dollars for every dollar's worth of feed consumed. These cows show the value of having a pure bred sire at the head of the herd.

Three years ago last summer a silo 30 feet deep and 14 feet in diameter was built, 8 feet in the ground and 22 feet above the ground. The 8 feet in the ground is built of an 8 inch brick wall, and above the ground it is built according to the plan of a silo described in Bulletin 102. The silo furnished an abundance of succulent feed, and has proven a good investment every year since it was built. A more nearly balanced ration was also fed the following year.

At the close of the third year's test the herd averaged 8,057 pounds of milk and 307 pounds fat, an increase of an average of 952 pounds milk and 47 pounds fat over the second year's average and an increase of 2,257 pounds of milk and 83 pounds of fat over the first year's average. Every cow in the herd made an increase in fat over the previous year. Cow No. 2 produced 101 pounds fat over the previous year. Cow No. 6 was not fresh this year and made an increase of 32 pounds fat over the previous year.

At the close of the third year's test three of the lowest producers were sold (209 pounds, 269 pounds and 313 pounds fat). One heifer that had been raised was added to the herd and one

cow was purchased, that proved an excellent producer, producing 402 pounds fat.

At the close of the third year's test the lowest one-half of the herd averaged 266 pounds fat, six pounds of fat more than the whole herd averaged the year before, and the highest one-half averaged 349 pounds fat, a difference of 83 pounds fat.

At the close of the fourth year's test the herd averaged 8,628 pounds of milk and 324 pounds fat, an increase of 571 pounds of milk and 17 pounds of fat over the third year and an increase of 2,828 pounds of milk and 100 pounds of fat over the first year's test. This is an increase of \$23.00 on the net profits per cow over the first year's test. The lowest one-half averaged 280 pounds of fat and the highest one-half averaged 366 pounds of fat, a difference of 86 pounds of fat between the highest and lowest one-half of the herd. The lowest cow produced 251 pounds of fat and the highest produced 422 pounds of fat.

At the close of the fourth year's test cow No. 2, one of the best in the herd, died. She had produced 11,292 pounds of milk and 375 pounds of fat the last year of her life. No cows were sold. One new cow was bought. This cow, however, only produced 277 pounds of fat, falling below the average of the herd. One heifer was added that produced 228 pounds of fat. This also was below the average of the herd.

Last year one cow that had produced 402 pounds the previous year produced only 233 pounds of fat due to having been milked too long before freshening. This cow is making an exceptionally good record this winter having produced \$4.28 worth of butter per week on \$1.75 worth of feed. Cow No. 6 did not freshen last year. She had produced 422 pounds of fat the previous year and then produced 353 last year which was, however, 69 pounds fat less than last year. This cow was seventeen years old and was sold November 2, 1908. She was not in calf. During this cow's last lactation period, beginning January 13, 1907, and ending November 2, 1908, twenty-one months, twenty days, she produced 16,814 pounds milk and 761 pounds of fat. During the five years she was tested she averaged 8,625 pounds of

milk and 374 pounds of fat. On account of the fact that cow No. 2 died, No. 6 not freshened and No. 22 having been milked too long the previous year, the average of the herd dropped back to 307 pounds of fat last year. Ten cows that were in the herd last year made an increase of 18.7 pounds of fat over the previous year.

Last fall two cows were sold and one very promising heifer added to the herd. The cows this winter are doing exceptionally well.

Now I want to speak of the care of the herd. Unless one cares properly for his cows and feeds them up to their limit, you cannot hope to accomplish very much in the raising of the average production of the herd. Neither Colanthe 4ths, Johanna nor Jacoba Irene could have made the records they did if they would not first have received in their feed the protein, carbohydrates and other extracts necessary to maintain themselves and produce the milk and butter fat that each cow produced. As much depends on care and feed as upon weeding out the poor cows. During the winter months cows should be kept in a warm, well lighted and well ventilated barn. Too much emphasis cannot be placed on good light and good ventilation. They are essential to good health. The best way to ventilate a barn is by the King system. A description of this system is found in "Physics of Agriculture," by Professor F. H. King of Madison, Wisconsin.

If a cow is to do her best she must be kept comfortable and contented. Professor Haecker says a cow will consume more feed for maintaining herself if kept in uncomfortable quarters.

A cow producing a large flow of milk must be made to consume a large amount of water daily. Unless she does, she cannot be expected to keep up her flow of milk very long. In order that a cow will consume the necessary amount of water daily, it must not be colder than 48 F. If colder she will not consume nearly enough. Many times have I observed cows going to a tank containing iced water, drink a small amount of it and then go away shivering. A cow in this condition will require nearly all her feed to keep her body warm and will have very little left

to produce milk. Producing milk under such conditions is like heating our homes with all doors and windows open.

My cows are turned out to water twice a day, in the morning and in the evening. They go to a spring ten or twelve rods from the barn. No matter how cold or blustery the weather they always go to the spring and drink and never shiver and seem cold afterwards. The temperature of this spring water is 48 degrees F. during the winter.

Now a word about feeding the cows. They must be fed a balanced ration. Professor Fraser says: "A cow cannot give in her product what she does not receive in her feed." A cow weighing one thousand pounds requires approximately 7 pounds protein, 7 pounds carbohydrates and 17 pounds fat for a maintenance ration. And for every ten pounds average milk she requires an additional ration of .5 pounds protein, 2.2 pounds carbohydrates and .17 pounds fat. A cow producing 50 pounds of 3.5 per cent milk will require 3.2 pounds protein, 18 pounds carbohydrates and .95 pounds fat. One mistake many dairymen make is in not feeding enough protein. Nearly all of our crops in Illinois, except clover and alfalfa, are high in carbohydrate and fat, but low in protein. We must balance up the ration by supplying by-products rich in protein, such as oil meal, cottonseed meal and gluten feed. I sell my oats and buy bran, oil meal and gluten feed.

A good ration, besides containing the proper amount of protein, carbohydrates and fat, must be palatable and must be easily digestible. I find that a ration consisting of a variety of concentrates gives better results than one consisting of only one feed. I am feeding this winter one pound of oil meal to all my cows, excepting two which receive about 1 1-3 pounds daily. To the cows producing from seven to eight pounds of fat per week I feed in addition to the oil meal nine pounds of a mixture of equal parts bran, buffalo gluten feed, corn and cob meal and ground barley. To cows producing ten pounds of fat per week I feed about twelve pounds of the mixture and 1 1-3 pounds oil meal. To cows producing less than seven pounds fat per week

I feed less grain. Cows when dry receive no grain ration. For roughage, I am feeding 30 to 33 pounds silage, 8 pounds mixed hay and about 5 pounds corn stover.

In order to be successful dairymen, we must study the individual needs of each cow. Some cows are much more economical producers than others. I weigh the milk from the whole herd daily. Whenever the flow begins to drop off, I begin to look for the cause. In order to make the most profit out of our herds the flow of milk must be constantly kept up. If cows once drop down for any length of time, they will not come up again to where they were during that lactation period. A good dairyman, like a good engineer, must constantly keep his hand upon the throttle.

Now, one of the most important things is to have a good sire. Cow No. 21 is a daughter of cow No. 14, whose average production for four years was 7,614 pounds of milk and 246 pounds of fat. The sire of cow No. 21 was a full blood Holstein. This cow produced during her first lactation period 7,554 pounds of milk and 272 pounds of fat. She dropped her third calf on September 4, 1908, and produced during the first five months of this lactation period an average of 9.17 pounds of fat per week. A gain of $28\frac{1}{2}$ per cent over the corresponding period last year. If she continues to do as well for the balance of the year she will produce 350 pounds of fat this year. An increase of 104 pounds of fat per year over the four years' average of her dam.

Cow No. 17 was sired by the same bull as cow No. 21. This cow produced last year, her third lactation period, 8,929 pounds of milk and 303 pounds of fat during twelve months. During her second lactation period she produced 8,887 pounds of milk and 345 pounds of fat in twelve months. Her last year's record exceeded her dam's record for one year by 2,959 pounds of milk and 89 pounds of fat. She produced an average of 348.4 pounds of milk and 13.24 pounds of fat per week on pasture alone last June.

Another heifer produced an average of 8.6 pounds of fat a week during five months of her second lactation period this winter, and is doing well now.

Now let us see what this improvement amounts to: Cows Nos. 1 and 14 returned an average net profit of \$50.00 each per annum. Their daughters returned an average net profit of \$85.00 each. An increase in the net profits of an average of \$35.00 per annum each over the net profits of their dams. An increase of 70 per cent. A herd of twenty cows like these daughters is equal to a herd of thirty-four cows like their dams.

In order that heifers may develop into profitable cows, they must not only be well bred, but also well reared. They must be well nourished on nitrogenous food, and kept in clean, dry quarters from birth to maturity.

Unless we give the young calf the proper care and nourishment that it needs to develop, we need not look for much improvement in our dairy herds.

The most valuable feed for calves is skim milk, alfalfa and clover hay and silage.

The question is frequently asked, "Does it pay to feed cows as you do?" or some one will tell me: "Figure what you feed into your cows and you have very little left."

Now let us see, after carefully weighing the feed I feed to my cows, I find that I am feeding \$17.50 worth of feed to twelve cows per week.

These twelve cows return \$36.25 per week on butter fat alone. These twelve cows produce approximately 2,400 pounds skim milk per week. This at 25 cents per cwt. is worth \$6.00 making the total receipts \$42.25 per week, a net profit of \$24.75 over the cost of keeping these cows. These cows returned \$2.45 for every dollar's worth of feed consumed. My herd averaged 307 pounds fat per cow last year. This is equivalent to 358 pounds butter, which at an average price of 32½ cents per pound is worth \$116.35. At 25 cents per cwt. the skim milk is worth \$20.00 per cow, which makes a total receipt of \$136.35 per cow per year.

It costs me an average of \$52.00 per cow for feed for a year, leaving a net profit of \$84.35 per cow per year. The herd returned \$2.62 for every dollar's worth of feed consumed. The best one-half of the herd averaged 350 pounds of fat, which is equivalent to 408 pounds of butter, worth \$132.60. The skim milk averaged \$24.00 per cow, making a total of \$156.60 per cow per year. Allowing that the best one-half of the herd consumed \$10.00 worth of feed more than the poorest one-half, the best one-half returned a net profit of \$99.60 per cow per year. The best one-half returned \$2.75 for every dollar's worth of feed consumed.

Stepping stones to successful dairying:

1. Weed out the poor cows by means of the scales and Babcock test.

2. Feed the good cows a balanced ration.

3. Grow alfalfa and provide an abundance of silage.

4. Head the herd with the best sire obtainable.

5. Raise the heifer calves from the best cows.

6. Continue to weed, feed and breed.

Member: What kind of cows do you have?

Mr. Foss: I was fortunate in marrying a girl that had a Holstein cow from home, and that Holstein cow was so much better than the others that I took a liking to that cow, so I have been going into Holstein cows. The fact is this, anything that is black and white will go; with me it is the cow that produces the most milk.

Member: What kind of sire do you use?

Mr. Foss: I use a sire that has good records back of it. At the present time I have one of the best that I ever had.

Member: Has your appreciation of your wife grown as your appreciation of the good cow has?

Mr. Foss: I have found out that this Holstein cow was head and shoulders above the other cows.

Mr. Sanmann: Ten years ago we could not sell a Holstein, today they will bring at a public sale \$75.00 while the red cow will average about \$45.00. There is something that you must

not lose sight of. It is essential that you weed out the poor cows. It is essential that you feed the cows a balanced ration.

Mr. Foss: The figures that I have given you is an average, that is not saying that this will not require more or less change, you must study the individual cow. When we are feeding so much to this cow, I will give her more to see if I cannot get her up higher. I like to have my cows in good shape but not exceedingly fat.

Another illustration: Last winter I had one cow that was freshened a year ago the 19th day of October, that was a Holstein. I had one Jersey, I sold her, not because she was not good but because she was old. I compared this Jersey with the Holstein, the Holstein made from 10½ to 11¾ pounds of butter fat per week while the Jersey only made nine. I am not saying a word against the Jersey but I like the Holstein best. There are two reasons for it, the first reason I had that cow from my wife and I fell in love with that cow, and the second reason is that just above me there is that territory where the cheese factories are, you cannot sell anything but Holstein milk. This Jersey cow I had to sell at a sacrifice. People will not pay more for Jersey milk than they will for Holstein milk. It costs more to produce and consequently they do not want a Jersey cow, those are the two reasons.

I am going to emphasize the fact that you must study the individual cow. It takes just as much intelligence to run a dairy farm as it does to run any kind of a corporation. If you want to be a successful dairyman, you have got to read and to study your cow and you must watch that cow as an engineer does his engine. The closer you devote yourself to the dairy business the better you will succeed.

Another thing is that you must have a good sire. The trouble is with the farmers today they do not see the difference between a sire that has ancestors for generations back that are producers and one that does not. That sire must have the ability to transmit that producing ability; if he does not have that ability he is worth nothing. You take the sire that has that back

of him, he is more likely to transmit those qualities than the sire who has nothing back of it. There are those who will not pay more for that kind of a sire. I can sell my gray bull calves for \$10.00 just as soon as they are born. I say I would advise you to buy a pure bred, but if you are bound to buy a gray bull you might as well buy mine.

We are here for the advancement of the dairy business and I would not advise anything that is not for the best interests of the State of Illinois. It is impossible for every farmer to have a pure bred herd but you can have a pure bred bull. Some farmers will not buy a pure bred bull because it costs him a little more at the time; they do not look ahead, they look just at the present. If you have a pure bred sire he will produce herds that will increase your net returns 75 per cent.

Mr. Sanmann: What is your net profit per cow?

Mr. Foss: I never figured that out, I figure the gross receipts.

MR. PRATT'S STATEMENT

Chairman: Following this paper we have something in the same line from Mr. Pratt and I will ask Mr. J. P. Mason to read it.

Mr. Mason: It is a credit and honor to know a farmer who can put up a statement like this.

Please find enclosed statement of my dairy account for the year 1909. Before going further, will say the feed on hand January 1, 1910, is practically the same as that on hand January 1, 1909, also I had 59 milking cows on hand January 1, 1909, and have the same number January 1, 1910.

I think it would be well at this time to give the number of acres on the farm, and the crops raised on said farm. I have 131½ acres in my own farm, and rent 80 acres, making a total of 211½ acres. Had 60 acres into corn, 30 of which was put in silo; the other 30 were shocked and husked. Had 40 acres of hay, consisting of 20 acres Alsike clover and 20 acres common

red clover and timothy; 4 acres of rye which was cut and put in silo, and 3 acres of Alsike clover about the middle of June, which I began feeding July 1st, and same lasted until the middle of September, when we commenced filling silos with corn.

I have two silos, one 16x30, the other 16x36, both stave Indiana Silo Company Silos. I have a Bell City Feed Cutter and Blower, which is run with an 18 H. P. gasoline engine. Therefore, we do not have to be under obligations to others but can fill silo when and how I like. I think those seven acres of rye and clover was the most profitable crop I raised, as it stood me in good stead, as you will see by the number of pounds of milk I got through the dry time and fly time of the summer of 1909, which all the dairymen of Northern Illinois and Southern Wisconsin will well remember. I had 15 acres of oats and the balance of land was in pasture. Below you will find the number of pounds of milk produced per month that was shipped to the St. Charles Condensing Factory, at St. Charles, Illinois:

January	37,846
February	34,856
March	37,571
April	32,776
May	34,000
June	35,632
July	30,982
August	32,141
September	32,717
October	38,496
November	36,516
December	42,617

426,150 pounds

I have raised fifteen calves, which I fed 18,360 pounds of milk, sold to private parties 3,876 pounds, making a total of 448,386 pounds for the year, or 7,600 pounds per cow. The average price of milk being \$1.40 per 100, would make each cow's

milk bring \$106.40, and being 59 cows in the herd the grand total would be \$6,277.40. Besides the fifteen calves that I raised I sold \$200.00 worth of veal calves. I have twelve two-year-old heifers which have advanced in price the last year \$20.00 per head, or \$240.00. Have twelve yearling heifers which have advanced in price \$10.00 per head, or \$120.00. Total amount derived from dairy from January 1, 1909, to January 1, 1910, \$6,837.40.

Now taking the debit side of the sheet, we have 80 acres of land rented at \$5.00 per acre, or \$400.00, feed and mill stuff bought, \$825.00. Hired help, five months \$725.00. Hired help seven months \$1,085.00. Blacksmithing bill \$40.00. Repairs \$50.00. Threshing \$25.00. Binding twine \$25.00. Gasoline \$25.00. Taxes \$50.00. Depreciation on fifteen cows \$450.00. Two cows died \$160.00. Interest on money invested, farm included \$20,000.00 at 5% interest \$1,000.00. Total \$4,860.00.

This would leave a net profit of \$1,977.40.

As you know, I am not on my farm, and only go up there occasionally, and have to depend entirely on hired help. I think the possibilities of farming and dairying are in their infancy. Farming is the grandest occupation, and with our experimental colleges and machinery of the present day one can scarcely conceive the advancement that will be made in dairying in the next few years. I am quite sure that I had a number of cows that gave over 10,000 pounds of milk last year, as twelve of the cows in this dairy were two-year-old heifers, with their first calf. I wish to say that I have an exclusive Holstein dairy, six of them being pure breds. The remainder are very high grade, as I have kept a pure bred sire for the past twelve years.

Member: Do you feed your silage before or after milking?

Mr. Mason: Before I milk.

Member: Do you ever have any complaint?

Mr. Mason: No; I ship my milk to the Chicago market. In the spring when I was in Chicago to make a contract after

shipping five years I was told that I shipped in better milk than ever before. He did not know I had a silo.

I will say here that Mr. Pratt is a farmer on a farm of 2,000 acres; this is run with hired help and I take it that this is a pretty good statement to make. The net profit after deducting out 5 per cent is \$1,977.00. There are four brothers, they have the reputation of doing good business, I was talking with one of them the other day, he said he milked 65 cows, getting 40 cans of milk, another was milking 35 cows and getting 18 cans of milk, and he further went on to say they had done that for three months. Now, gentlemen, that is doing business. Those Foley boys all own farms.

Chairman: I do not want to take any credit away from the Elgin business, but I want to tell how I went into a store on the corner. I met the manager there, I did not stop to get this man's name. There was a man that came in and said he was milking eleven cows; he presented a check for \$139.64. He was asked what it was for, he said it was his milk check for milking cows for the month of December. Just taking that month of December as an average, I do not know whether that man has a fresh herd or not, that would bring him on an average \$152.33 per cow. He is shipping his milk to St. Louis so there are some good cows in this neighborhood.

Mr. Jensen: Did you ever have any experience in feeding beet sugar?

Mr. Mason: Very little.

Mr. James: Have you any experience in beet pulp? It is not considered a very good feed.

Mr. Wilkins: A man the second door from me a year ago last fall bought a car load of beet pulp and tried to introduce it at Marengo. He sold a little but had a good deal left on his hands. I notice he is not feeding any this year.

Mr. Spies: With regard to rye, has Mr. Mason had any experience in making silage of rye? I am contemplating doing that.

Mr. Mason: I have fed rye a number of years, green. I had four and a half acres and I kept count. I fed 28 cows for 26 days and I received just \$42.00 in milk.

Mr. Spies: Would it not be better to cut it in for silage?

Mr. Mason: It comes when it is worth something.

Mr. Spies: How tall do you have the rye when you sell it?

Mr. Mason: Pretty good height. It grows fast. I never had any complaint in feeding rye until the day I took them off it. I have got a good crop this year on a pasture that is rich and I expect to make \$50.00 an acre on the milk this spring and then get a good crop of ensilage.

Chairman: I know Mr. Pratt, the gentleman who gave this paper to Mr. Mason. He is a farmer on Dun's large farm. What I got out of that statement surprises me. He estimates the total value of his investment at \$20,000, in his expenses he charges 5 per cent interest at \$1,000, which leaves \$19,000, making 15 per cent on his investment.

You men in Vandalia who are thinking of going into the dairy business can see the possibilities, 15 per cent on your money. How can you do better?

HANDLING MILK AND CREAM ON THE FARM.

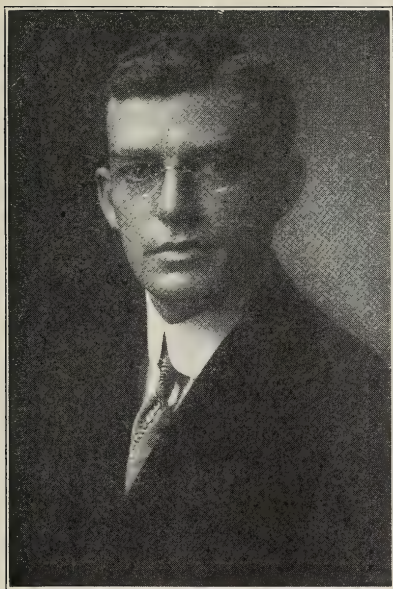
By

N. W. Hepburn, University of Illinois.

Time is galloping away. We have with us this morning Mr. Hepburn of the State University. I would like to ask him to give us a few words on any subject he pleases.

Mr. Hepburn: Mr. Chairman, Fellow Dairymen: The subject that is assigned to me on the program is "Handling Milk and Cream on a Farm." I could add very little to what has already been said about the handling of milk or cream, either from the standpoint of the producer or the consumer, but if we are able to add even one little bit in favor of clean dairy production, we are doing a great deal for the dairy business.

In these days of constantly shifting processes in dairying, the manufacturer may mean a great variety of persons or concerns. We have all sorts of modifications, from the plant that turns out the thousands of pounds of butter daily, to the little infant that converts the raw milk into heat, energy and life. If the farmer, the dairyman, the bottling plant and the condensary could have been persuaded long ago to adopt those methods which would result in a product fit and wholesome for the weakest of these, the problem of clean milk and pure dairy products would have settled itself and we would now be justified in our efforts to increase quantity and maintain quality. As it is, the note sounding loudest at every step in the process of manufacture is "quality." From the receiver's door down to the consumer's table we hear the clamor for a product of better quality. And why, do we ask? Surely not because the producers, dealers and handlers of milk do not know the evil results of careless methods. For years investigators and public speakers, together with the dairy press, have made the spreading of such information the chief part of their business. Then who is to blame and in-



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deed what good would it do if we knew? Shifting the responsibility will never make our milk more wholesome, our cheese less bitter or our butter less rancid; all of which terms imply improper care at some particular stage of the process.

It is in meetings of this sort that we must face the situation squarely and deal with the facts, unpleasant as they may seem. Everyone in the line, from producer to manufacturer has sinned and one is not less guilty than another, simply because the nature of his business enables him to transfer the blame to some one else.

The handling of milk and cream from the standpoint of the manufacturer is not essentially different from that of any individual, other than it looks in both directions. On the one hand it sees coming the great procession of dairymen in the State of Illinois, most of whom are armed with knowledge sufficient to enable them to bring from their herd a grade of milk suitable for the most delicate invalid; on the other, it sees an army of commission houses whose business it is to pay on the basis of quality. In the middle then stands the great manufacturing interests with power to command the proper grade of raw material and whose duty it is to make the best of whatever it gets. And here is the whole of the business in miniature.

The manufacturer cannot make a first grade product from a second grade raw material and to this extent the farmer and the dairyman, the producer of milk, are responsible. But what inducement has been offered for a material capable of making the best manufactured product? Little, when the price paid for the can of gaseous cream with bulging sides and cover, is the same as for that can suitable for the making of the best grade of butter. Little, when a neighboring plant takes what the home one rejects as unfit for use, in order that another patron may be added to its list. Foolish competition has been a hard master in our efforts to maintain and develop quality. Greediness in the dairy business is not confined to the man who is guilty of increasing the milk flow by the addition of water. It is also one of the faults of the consumer. The arguments in favor of but-

ter substitutes work a hardship on the producer of high grade butter.

Perhaps one of the greatest barriers in the past against improvement in quality has been this aforesaid shifting of the blame to the nearest dumping ground until they have all been piled so high that they finally come tumbling down at the stable door of the farmer.

We as farmers recognize that there are certain duties incumbent upon the producer of milk, if our state is to rank high among those making quality a paramount issue, and that there are certain precautions necessary to be taken, about stables and care of utensils, if the best grade of milk and cream is to be produced. But, if we leave off at this point, as has been done in the past, we are unfair and do not make an even distribution of the responsibility. Lack of care will as quickly ruin the dairy product in one place as another. The desirable characteristics may be destroyed in the condensing plant. Filth will ruin cream as quickly in the factory as on the farm. Milk and butter may spoil in the housewife's cellar. So what we are clamoring for is not some one to blame but co-operation on the part of all those who have a part in handling the dairy product in any of its phases.

From the producer's standpoint we readily understand that the best raw material is not obtained in stables reeking with foul odors. It is now a matter of common knowledge that the souring of milk and the development of bad flavors is largely a bacterial process, the presence of which in large numbers, is usually accomplished by unsanitary surroundings. So the dairyman's problem is largely one of diminishing the number of these organisms and producing conditions unfavorable for their growth. This means careful washing and sterilizing of the dairy utensils and making the best use of the well water at hand for cooling purposes. In this connection one word is appropriate, concerning the transportation of any of the dairy products. Especially is it true concerning the handling of milk. The unfavorable conditions that often prevail are the delivering of milk

too warm in summer and often too cold or frozen in winter. If the creamery is receiving whole milk one serious objection to frozen milk is the difficulty of obtaining a proper sample for testing. In either case the covering of cans with some sort of protection will aid materially in keeping milk in good condition during transportation. These simple precautions are of course most applicable to conditions where whole milk is being handled.

It is not uncommon in our present day dairying to find concerns demanding special systems of ventilation and coating of whitewash in places where milk is produced. This is not merely that a building of this sort looks better with a cupola, or that a coat of whitewash makes it more sightly; it is simply an added emphasis of the growing knowledge of the conditions favorable to the production of a sanitary article.

In a similar way we meet the same problem when we come to the question of selling butter fat in the form of cream. In securing cream for butter making purposes the same sanitary measures are necessary if we wish in the end to have a fine, highly flavored butter. There is no part of the process of manufacture that will free foul cream from its odors or restore that much desired delicate flavor. Cream once robbed of these desirable qualities is ruined forever as far as the question of first grade butter is concerned.

It is as necessary to cool the cream from the separator as it is the milk from the cow. Mixing warm and cold lots of cream together is especially disastrous to successful buttermaking. Circular No. 131, of the Illinois Experiment Station, gives in a concise way a convenient method for caring for cream on the farm. Many have found this, or a modification of it, quite helpful in keeping cream before shipping or until the churning day. In handling cream one of the most abused utensils is the separator. It has often been blamed for our low quality of butter. When the semi-weekly system of washing is followed the new milk and cream, coming in contact with deteriorating separator slime, is bound to suffer in quality. In not a few instances the agent selling the machine has been responsible for

such practice. The argument of self-cleaning is a poor one and we have yet to see the make of hand separator cleanly enough in habit to be found going to the river for a morning bath.

Needful and practical are these suggestions to farm conditions and they play no minor part in controlling the kind of product that leaves our creameries, bottling plants and other manufacturing establishments. Bacteria are as active and foul odors as penetrating in the manufacturer's plant as they are on the farm. So, the same rule employed by the dairymen to secure a sanitary article should be more rigidly enforced by the manufacturer. The care of utensils and the cleaning of pipes need, if possible, even more careful attention, for there is more at stake. In special instances all the milk or cream may become contaminated by passing through one filthy pipe, in which instance, a creameryman's convenience becomes his enemy. Speaking from the standpoint of the creameryman, though there may be a difference in the skill of buttermakers in handling the raw material, no one has become such a master of his trade that he is able to restore those delicate flavors when once they have been eaten away.

In the educative moments for better dairying the manufacturer occupies a peculiarly enviable position. He, above all, is in close touch with the source of production and the instances are plentiful where the seed of good dairying, scattered by the manufacturer, has in later years yielded a plentiful harvest of progressive and systematic dairy farms and farmers. Such improvements are not only the result of his immediate contact with the milk producing centers, but also the result of the manufacturer making use of his imperative position. If correct methods are pursued he is not only able to instruct but to request more than he may demand.

The consumer also plays no small part in this campaign. Perhaps no stronger appeal can be made for purity and quality than that of a public sentiment. Sentiment that is the result of familiarity with the dairyman and his problems, and which understands the true meaning of the term wholesomeness, purity

and sanitation; sentiment that develops into a demand and a willingness to pay for the "best." To this extent then the consumer may help and is responsible for quality in our dairy product.

In conclusion we may note that to the producer the problem is a financial one. Just as the inferior article in every line sells for a lower price, so the inferior and damaged dairy product will bring an inferior price. This without doubt will be truer in future years than it has ever been in the past. More than this the problem is a moral one and dairying will see a brighter day; when one man will not offer for sale to another that which he would not use on his own table.

Chairman: Any questions on this subject?

Mr. Mason: Mr. Wiggins is throwing it up to me about our Elgin district. This farm that I run is run with hired help. A lady made a statement at our Institute lately about a cow she had that gave 17,000 pounds of milk, she retailed at 8 cents a quart. That cow brought in more than \$800.00 a year. That lady's name is Mrs. Durand.

Chairman: I will take my hat off to Mr. Mason, I cannot beat that. I did not intend throwing any slurs.

If there is nothing further we will stand adjourned until 1:30 this afternoon.

Friday Afternoon, January 21.

MARKET MILK.

By

L. A. Spies, St. Jacob, Ill.

Chairman: I am sorry that more dairymen have not availed themselves of the opportunity of being here this afternoon. It may be possible that it is because of the weather, the cows may be cold and need more attention.

We are delighted this afternoon to have with us Mr. Spies, President of the Union Dairy Company of St. Louis. He has done more for this country in the Department of Dairy Industry than any man I know of. He has been plugging away at it for many years, and I am glad to say that it has given results, and we all wish him a long and prosperous future.

Mr. L. A. Spies: Mr. Chairman and Fellow Dairymen: Eighty per cent of the city milk supply is now drawn from the country while thirty years ago it was produced within the city limits; then the driver carried the milk in bulk, dipped it with a measure from the can into the patron's pitcher. Science has taught the people that the milk becomes infected with all kinds of microbes while thus exposed. The milk is now delivered in bottles, and this is a source of great worry and expense to the dealers, owing to the great loss of bottles from breakage and other source. The Company with which I am connected loses \$8,000.00 annually in spite of checking the drivers out and in.

All dealers of St. Louis formed a Bottlers' Association, have a clearing house where they deliver all stray bottles, receive 2 cents per dozen and pay 6 cents per dozen for their own sorted out. Recently the larger dairies of St. Louis have acquired receiving stations along the various railroads where pasteurizers and ice machines have been installed. The milk is carefully handled and kept until train time. This method gives

much better satisfaction because the milk arrives on the market in a sound condition every day.

The use of milk for a diet is growing rapidly, the physicians knowing it to be of good quality recommend it to their patients, and many special milks are bought under guarantee of being rich in butter fat, the herds free from tuberculosis, etc., among those special milks. Certified milk is in the greatest favor. Two years ago three farms were producing all the certified milk sold in St. Louis, now eleven farms are producing three times more certified milk for the city.

A pure milk commission organized for the purpose controls certification of the farms where this milk is produced. The Commission is composed of physicians and charitably inclined persons, these all work without pay, they visit the farms at least once a month or oftener. If their recommendations are not heeded, the certificates are withheld or the farm placed on probation or suspended entirely. New certificates are issued on the 20th of each month, folded and placed under an embossed tin cap, securely sealed on every bottle on the farm. It reads as follows:

MILK COMMISSION CERTIFICATE

Date January 20, 1910.

Milk and Cream from
CALLALILY DAIRY

Located at St. Jacobs, Ill.

L. A. Spies,
Proprietor.

And the dairy itself, has been recently examined by the experts of the Commission and found to be up to the required standard of excellence. Another examination will be made within a month, and, if satisfactory, new labels for the bottles will be issued, dated February 20, 1910.

(Notice the date).

St. Louis Pure Milk Commission.

The future of the painstaking dairyman for clean, wholesome milk is brightening for the clean in preference over rich in butter fat.

The premises on which certified milk is produced must be sanitary, plenty of good well water (drainage) no surface water is allowed in barn yard or pastures, next all manure must be hauled away daily, hogs are not allowed in yards or pastures. Horse barns or pastures are not allowed to be nearer cows than 300 feet, cow barns must have concrete floors, mangers good and smooth, plenty of light and a system of fasteners so that cows can be lined up on the gutter in rear.

Cows must be well groomed each day before milking. In addition Callalily Farm has a milking room adjoining main stable where four cows are taken at a time, milked, first washing their udders with clean water, then dried with a clean towel; the bottling room is separate but adjoining. A sterilizing room for bottles and all utensils such as pails, bottle fillers and stools. 240 degrees of heat are turned on and maintained for one hour. Samples of all certified milk are taken at least once a week by inspectors, four samples taken to the City Chemist's office, there analyzed for butter fat, bacteriological count, solids, acidity, etc. The results are reported to the Board of Directors of the Pure Milk Commission and a copy sent to the proprietor of the farm. The health of the employees is essential as well as cleanliness. They wear clean white duck suits while engaged in milking.

The improving of the milk supply of all large cities was slow for it could not be replaced with a better article, but the gradual taking of the inspection out of politics and placing it in the hands of Boards of Health, composed of physicians, has done much good, also enforcing the pure food laws.

Chairman: Any questions?

Mr. Mason: Do you prefer silage milk?

Mr. Spies: I would just as soon have silage if produced in a sanitary way.

Member: When do you feed silage?

Mr. Spies: After milking. The care and cleanliness in milking with the first hour's care in cooling have much to do with the keeping quality of the milk and its fitness for food afterward.

To illustrate: In dressing pork, the animal must be well bled, all animal heat cooled out to make good food. If this is not done decay will soon set in; if milk is poured into a can, the lid shut down while the animal heat is in it, it has a smothered smell, soon decays even in cold weather.

Member: What kind of silo do you think is best?

Mr. Spies: The kind that we have on the Callalily Farm at St. Jacobs, Illinois, it is made of a glazed tile filled with reinforced concrete 40 feet high and 14 feet in diameter.

Member: Could you give any definite figures as to the cost of constructing a silo of this kind?

Mr. Spies: That silo cost \$425.00 complete, roof and all, but if I were going to build again I would make it 14 feet wide and 50 feet high.

Member: Is there no danger of that silo blowing over?

Mr. Spies: None whatever, for it is reinforced with iron, the same as smokestacks 4 feet in diameter are built 200 feet high. I never heard of one blowing over.

Member: Do you think it could be built any cheaper now?

Mr. Spies: Yes, I think I could build one for \$350.00 now. The beauty is in the strength and durability of this silo. It is smooth inside and outside strong enough to hold wheat if 100 feet high and filled to the top.

Mr. Jansen: When a 40 foot silo is full you have to climb to the top every time you feed.

Mr. Spies: The depth of the silo is its best feature. Years ago they weighed the silage because the firmer it is packed the better, now that machines blow silage high about as easy as low, build it high to get the pressure.

Mr. Jansen: I wish to say that six years ago we asked Mr. Spies to come to our Effingham County Dairymen's meeting to talk along these lines, and the people are satisfied with the re-

sults. Our dairymen had him come back several times and have learned from experience that he knows his business, that he can go out on the farm and do what he tells you to do, that he has tried all these things on his own farm. Between sixty and seventy silos have been built near Effingham, a great saving to us farmers. We follow the gentleman's advice to our profit.

Mr. Spies: I have never had to take anything back that I said at a dairyman's meeting because I learned my lesson in the school of experience. As far back as twenty years ago my net profits from fifty head of registered Holstein cows was \$102.50 per cow after all expenses were paid and a calf for good measure to boot.

Chairman: How would you go to work to start the dairy industry in a new territory?

Mr. Spies: We have here with us a dairyman who started in under my advice, Mr. Causey. He had seven common cows, after the first year four were found unprofitable and he disposed of them and I found him ten high grade Holstein cows that I had brought from Wisconsin the year before. He bought these ten cows, at the same time bought a registered Holstein sire, he raised the heifer calves and has now got a fine herd of profitable cows.

Chairman: After you get the cows you would weigh the milk, take sample tests for butter fat, weigh the feed and keep a record of these cows?

Mr. Spies: I certainly would, and remember that the sire is over one-half the herd; get the best.

Mr. Wiggins: Mr. Causey says that each cow averaged him \$153.00 per year, and if the feed cost \$53.00, that would leave \$100.00 net, now figure the depreciation at \$10.00, the labor would cost \$18.00 per year per cow, that would net him \$72.00 per cow.

Mr. Causey: I do not hire any labor.

Mr. Wiggins: Then you are that much ahead. Your ten cows then would bring you in \$1,000.00 per year. Mr. Mason says he had fifty-five cows and they netted him \$1,900.00.

What I want to bring out is this, there is a greater per cent of profit in a small herd than in a large herd. I speak from experience in a large herd. A man does not need to be afraid to go into the dairy business.

There is a man in Springfield who has sixteen cows. His net returns on those few cows is in the neighborhood of \$200.00 a month. He gets 9 cents a quart for his milk. I would like to see a man beat that. I did not mean to interrupt you but I wanted to bring out a small herd proposition. Mr. Causey, are your cows freshened in the fall?

Mr. Causey: Yes, altogether.

Mr. Wiggins: Don't you find cows freshened in the fall give more milk than if freshened in the spring?

Mr. Causey: I get a third more milk.

Mr. Wiggins: Do you rely on the pasture in the summer?

Mr. Causey: Yes, and I only have seven acres of pasture.

Mr. Wiggins: At what time do your cows begin to freshen.

Mr. Causey: My cows started to freshen the last of September and my last cow freshened in December.

Member: You say you have eleven freshened cows to make this December check?

Mr. Wiggins: If you can make \$600.00 out of eleven cows one cannot beat that.

Mr. Spies: I will say this for Mr. Causey's pasture: it was the finest I saw last year.

Mr. Causey: The past year I have raised 15½ tons of Hungarian hay out of 31 80-100 acres.

Mr. Gilkerson: A neighbor of mine told me that Mr. Causey's farm is one of the best farms around. He states that it is because he has kept these cows on a small farm which is gradually getting better. Many of us try to do too much. When I was on the cars coming here a man said to me: "This soil is from 2 to 15 inches deep, you cannot do anything down here." But I can readily see that it is this dairy business that is going to make this country.

Mr. Spies: I go twice a year to Mr. Causey's place. It is as fine a little farm as I know of.

I really feel grateful to the Illinois Association for coming down into my territory. We work in conjunction, and I tell you the farmer is friendly toward me. I do not ask him to put up stations for us and pay for them and they know it. I grew up on the farm and among the cows.

The mutual benefit comes in this way, we need the milk in the city and the farmer will produce it if he gets good returns. That has been my experience in the past.

Member: If you were going to build a barn how would you go about it?

Mr. Spies: If I were going to build a barn I would look up barns and take the best barn for a model. I was taken with the Fort Atkinson idea. I would have plans drawn and then submit them to an expert, that is what I would do if I were going to build a barn today. Make up my mind how many cows I want to stable, and then submit it to Hoard's Dairyman. Work out your plan. In fact what you want to do in the way of a barn at the present time is to get your plans and everything complete. Be sure you are right and then go ahead. There are lots of things I like and lots of things I do not like.

Member: Some farmers are so dense, it takes forever to convince them.

Mr. Spies: Yes, they are hard to handle if they do not want to be handled.

Member: Will it pay a man with a high grade of milk to sell it to a creamery and keep the skim milk at home?

Mr. Spies: In high testing milk it seems to me it would pay better to separate it and keep the skim milk at home at the present time.

Member: I just started in the dairying business, since the 10th of November. I used to dairy in Iowa. I have four cows, for the month of December they brought me in \$51.90, for the three weeks in January \$37.00, that is \$14.00 per head. I send the cream to Decatur and keep the skim milk at home.

Mr. Wiggins: What is the condensary price?

Member: \$1.75.

Mr. Spies: Take half your milk and deliver it to the market, and take the other half and separate it, that would solve your problem.

Member: These cows were tested by the Illinois Dairy Company at Springfield. They tested 5, 5-3 and 6-5. Three are registered. They were tested during the month of September. These cows were freshened in March.

Mr. Spies: The best way is to get a Babcock tester, weigh all the milk, take your samples the same as the State does.

Mr. Wiggins: If one does not want to put the money into a large tester, they can use a small machine.

Mr. Spies: If our friend gets \$51.90 out of four cows, they must be good milkers.

Mr. Wiggins: He does not know whether it is best to sell the whole milk to the condensary or whether it is better to sell the cream and keep the skim milk at home.

Mr. Gilkerson: I think the University is doing good work. It has helped a good many of us on our feet, they are showing us how to start in. We farmers are like ordinary mortals, we are like a flock of sheep. If we see one fellow making a success we all want to try it. This is the way it will grow. If one man makes a success of it and his neighbors see it they all want to try it. I think now we are seeing the fruits of our agricultural experiment station.

Mr. Spies: Mr. Causey is one of the men who has staid with the proposition and does everything conscientiously. I know Mr. Causey has done good and faithful work.

Member: We ought to have testing stations in this vicinity. So far as sending out men from the agricultural college, I think it ought to be done by the railroads. I think there ought to be systematic testing.

Mr. Wiggins: Do you think the farmers as a rule would be willing to pay a man, say 50 cents a cow for these testing associations and pay 50 cents or a dollar for the record of that

cow kept by an experienced man that would call at his place once a month?

Say you and I get together and that we have twenty-six herds, don't you think it would pay us to put a dollar a cow to have them tested; don't you think it would help to educate us? Do you know of any place on your line where we could get enough farmers together to warrant paying a man enough money to do this?

Mr. Spies: I think it could be done.

Mr. Wiggins: If we could get men like Mr. James for instance who understood testing. There are plenty of men who are taking a short course. If they could go out with a certificate from the University and could get together, say twenty-six herds, if they could get fair wages, there are plenty of men that would be willing to go out. If we could get six men from the Experiment Station and the Dairy Association to co-operate, I am sure they would be willing to supply the men if we could get some local demand for such a man. The other states which have put in these testing associations have found that it is very beneficial and the district developed quickly. All the farmer has to do is to listen. The government is willing to send any of their men and help us organize these associations.

If it occurs to you that you can help to organize any one district, you have plenty of backing, and we are all ready to take it up with you. You can write to Mr. Caven or any of the Directors, and we will help you through if it interests you. We have not sufficient funds to send a man and pay his expenses and salary. Some time I hope we can. I hope we can get an appropriation some day.

Mr. Spies: Another thing I want to add and that is that this same man used a tuberculin test.

Mr. Wiggins: Dr. Wright tells us that the way the results can be obtained is to have this testing done by a man of great experience. He says he will do this, he will send his men in the different districts. He says all veterinaries are not competent. He feels mistakes have been made in reading these tem-

peratures. If these men could do it, it would be a great thing to get at it, but the question on the other hand would we not be adding too much expense. In other words, it takes a great deal of time to test these cows for tuberculosis.

Mr. Spies: I know that the dairymen in St. Louis have been considering employing a man for that purpose. We will pay more for milk that comes from tuberculin tested cows. I thought the two things could be worked together.

Mr. Gilkerson: I think that the only way the two things could be worked together would be to have the man that goes into the field work up the consent of the farmer to have the test. Dr. Wright told us he would be willing to help them out.

Mr. Wiggins: I think in a few years the Legislature will see the importance of this kind of work and make a sufficient appropriation so that with the assistance of the individual, through these taxes and individual levies we can afford to have competent men. A man does not derive the full benefits if he does not keep it up. Mr. Spies has been at it for twenty years. Mr. Foss who read his paper this morning has been at and kept at it.

I would like to see any business man abuse his business as the farmer does and keep above water. There would be more failures than there are. Keep books on it and know what department pays and what department does not pay. It is the abuse of the dairy cow in not knowing what she is doing for you that keeps so many of us farmers in the dark, and when we begin to realize that the farmer has got to work along commercial lines to compete with other industries, then we will begin to push before the Legislature the request for the necessary help. Anything else?

Mr. Causey: I just want to mention something about this business in connection with the experimental work. There are a great many of my neighbors out there that imagine that I am getting a big rake-off. When I went into this agreement five years ago I was to receive pay for all extra work that was necessary to keep this thing going, I was to get customary wages.

The first thing they did was to put in scales, everything that grew passed over these scales, grain, hay, etc. They put in scales that cost \$159.00. The next thing they put up a silo, the silo cost \$325.00. I sent them a bill of \$285.00 and paid the difference myself. I have never charged them a penny for work I have done. They said it would be necessary in the nature of the business that once in a while they would have to stay over night. They have never paid for a meal. I do not know if they intend to make any more improvements, but the way they are running it is no expense to them. I have not taken a cent and do not intend to; I am not going to make any charges.

Mr. Wiggins: You feel that they have made you dollars and you appreciate the service. Their experiment with you it seems to me is well brought out here today. They have given you a start and a lift. They have done it all over the state and are willing to do it. As far as I can find out the dairy department is always willing to lend a hand whenever another hand is extended to meet it.

Mr. Causey: I would like to see some other man take up the work.

Chairman: If you have become tired and wish to adjourn we can. There are quite a number of experienced dairymen here. It is moved and seconded that we adjourn, but before adjourning I wish to again thank the members of the Local Committee here and the citizens and the farmers who have helped to make this meeting what I consider a great success. I wish to thank you for the Association. I bid you good day.

A STUDY OF FACTORS INFLUENCING THE COMPOSITION OF BUTTER.

By

Carl E. Lee, Formerly Assistant Chief Dairy Manufacturers, Nelson W. Hepburn, Assistant Dairy Manufactures, and Jessie M. Barnhart, Assistant Chemist Dairy Husbandry, University of Illinois.

A study of the factors influencing the composition of butter is of importance, not alone on account of its relation to science, but also because of the practical application the knowledge derived from such a study, bears to the creamery industry.

The control of the composition of butter is of great value to the producer, manufacturer, and butter dealer. The dairy-men who make and sell dairy butter are directly interested in quality and they should be interested in composition in so far as it might affect their net returns.

All milk producers who are share-holders, or dispose of their milk and cream to co-operative creameries, are interested in both quality and composition, because the price paid for butter fat by these concerns is largely regulated by these two factors. Owners of stock or individual creameries should be interested in the quality of butter yet the question of composition should not be overlooked since both play a large part in making a plant successful. As a rule the price these creameries pay the producer is regulated by market butter quotations and not the net returns for a given amount of butter fat made into butter.. It is evident, therefore, that aside from quality a knowledge of the control of the fat content in the finished butter involves a financial problem. Naturally the percent of salt in butter must be regulated by the demand of the consumer, hence it is to the

creamerymen's interest to comply with such demand even though it may affect the total number of pounds of butter made.

A certain amount of water is necessary to make butter mechanically perfect. However, this does not mean that the percent of water must come within very narrow limits. The law sets the maximum amount at 16 percent. While it is true that two lots of butter varying 2 to 4 percent in water content can in a measure be distinguished when the body is comparatively uniform, the general appearance of a package or quantity of butter is not a sure indication of its composition. The dealer has a right to demand butter of such composition that it will safely be within the limits of the law and of such a texture that it will permit handling without a great deal of shrinkage.

Those who have made a study of manufacturing butter know that composition will vary with local, seasonal, and other conditions, unless these factors affecting butter fat are overcome.

In addition to studying some of these factors influencing the composition of butter, it seems wise to collect samples from the market for analysis which would furnish data for comparisons between different markets, states, and factories. These samples were no doubt fairly representative of the butter received on the Aurora, Elgin, and Chicago markets, during the seasons of 1907 and 1908. Results of analyzing these samples of market butter are reported in another bulletin.

Sampling Butter.

A study was made of the uniformity in composition of various samples taken from the same churning of package. It is apparent that in taking a sample of butter from the tub more or less water is forced to the top of the package as the trier is inserted. This free brine, as a rule, is picked up by the surface of the plug and trier when it is removed. In transferring the butter from the trier to the sampling jar all the free water adhering to the butter is collected with the sample. It is difficult to say whether or not this method of sampling is to be relied upon. However, it is the only method that can be followed without de-

facing the package. After the trier of butter is drawn and the sample taken, the top two inches is replaced, thus leaving the surface of the package in the same condition as if it had been examined for quality only.

It is noted that the amount of brine forced to the surface varies with the condition of the butter. When the butter is in a very soft condition, little brine is forced out and at the same time less water is seen on the trier. Storage or frozen butter shows no visible water either on the top of the tub or on the trier plug. Butter commonly found in the commission house did show this free water. It seemed, therefore, reasonable to sample the butter in that condition and at the same time carry on investigational work to ascertain the accuracy of this method of sampling.

May 10, 1907, a churning of 242 pounds of butter was printed in a Lusted printer. Before any of the butter was taken from the churn, the surface was cut off, and a sample taken from various places in the churn, and mixed in one sampling jar. This sample contained 14.05 percent of water. From each tray of 25 pounds the center one pound print was removed and a portion of it placed in a sampling jar. It was found that the sample from tray 1 contained 13.25 percent of water and the analysis of the other nine samples gave the following results: Sample No. 2, 13.41; No. 3, 13.05; No. 4, 13.38; No. 5, 13.21; No. 6, 13.01; No. 7, 13.68; No. 8, 12.99; No. 9, 13.21, and sample No. 10, 13.25 percent. Average from the 10 samples taken from the one pound prints of butter was 13.24 or 0.31 of one percent less water than was found in the samples taken from the churn. The butter made three days later was sampled in the same manner. Samples taken from the churn contained 13.64 percent water. The average percent of water, of the seven samples taken from the butter after it was printed was 13.27. The highest water content, 13.96 percent, was in sample from tray No. 5 and lowest 12.71, from tray No. 4.

May 15 all of the cream received was churned in two different churnings. The method of making and sampling the butter was the same as in the two previous lots. The sample taken

from the butter in the first churn contained 13.74 percent water. The average of samples from seven trays 13.39 percent; highest water content 13.84 from tray No. 3; lowest 12.83 percent from tray No. 4. The samples taken from churn 2 contained 13.39 percent of water. The average water content of the samples from the seven different trays was 13.37 percent; highest 13.57 from tray No. 5 and lowest 13.05 percent from tray No. 1, indicating clearly that there is a variation in the water content of samples of butter taken from the same churning.

A comparison was made to determine whether there was any greater variation in sampling the butter in the churn by means of a trier or a spatula. The following data were obtained from one day's churning. The butter in churn was worked 20 revolutions of the churn. Four samples were taken, two with a spatula and two with a trier. Spatula samples contained 13.26 and 13.24 percent water, respectively, and trier samples, 13.66 and 14.28 percent. One-half of the butter was taken out and printed with a Lusted printer into 125 one-pound prints. From each tray of 25 pounds the two center prints were removed for analysis. From one of these prints a sample was taken by means of a trier, and from the other the sample was made by cutting off one inch of the butter from each end, and one-half an inch from each side. The remainder of the pound print was placed in the sample jar, the analysis of which gave the following results:

Tray No.	Percent Water Trier Sample	Percent Water Print sample	Tray No.	Percent Water Trier Sample	Pct. Water Print sample
1	14.10	13.43	4	13.30	13.30
2	13.92	13.11	5	14.32	13.25
3	13.53	13.79	..	.....	.....
Average five samples		.....	..	13.83	13.37

The remainder of the butter in the churn was overworked ten revolutions. None of the water was allowed to drain out. The method of printing and sampling was the same as above.

Tray No.	Percent Water Trier sample	Percent Water Print sample	Tray No.	Percent Water Trier sample	Pct. Water Print sample
1	13.48	13.50	4	13.40	13.44
2	13.37	13.45	5	13.29	13.55
3	13.16	13.31	..	.....	.....
Average five samples		.....	..	13.34	13.31

The average water content in the ten one-pound prints of normal worked butter was 13.60 and the overworked 13.38 percent. The average water content of the 20 samples analyzed was 13.49 percent; the highest 14.32 and the lowest 13.11 percent. The average water content in the ten samples taken directly from the churn was 13.64; the highest 14.28 and the lowest 13.24 percent. The average of all samples taken from the churn was 13.50 percent.

The remainder of the cream delivered on that day was handled in the same manner except that no water was added to the butter, in the churn, after salting. The method of sampling was the same as in the above churning. The amount of water in the samples taken from the worked butter in the churn with the spatula was 12.70 and 13.14 percent, and with the trier 12.48 and 12.67 percent.

Tray No.	Sample of worked butter		Samples of worked butter	
	Percent water Trier Sample	Percent water Print sample	Percent water Trier sample	Percent water Print sample
1	13.09	12.36	12.88	12.88
2	12.62	12.93	12.94	12.92
3	12.87	13.89	13.03	12.82
4	12.99	12.78	13.07	13.16
5	12.81	13.16	13.52	12.77
Average		13.02	13.09	12.91

The average water content in the ten samples of worked butter was 12.93 and that of the overworked butter 13.02 percent. The highest percent of water in a single sample was 13.89 and the lowest 12.64. Butter was made the same on the following day. Four different samples were taken for analysis. Sample No. 1 from lower end of churn contained 13.38 percent water. Sample No. 2 was taken half way between middle and

lower end with 13.30 percent. Sample No. 3 was taken between middle and gear end with 13.44 percent, and Sample No. 4 was taken from the butter in the gear end with 13.51 percent. It will be noted from the above data that there is no more variation in water content due to methods of sampling than there is between several samples taken in the same manner from one churn.

The following day the cream was churned in two lots and four samples taken from different places in the churn.

Churn 1		Churn 2	
Sample No.	Percent water	Sample No.	Percent water
1	13.82	1	13.05
2	13.46	2	13.30
3	13.86	3	13.52
4	13.69	4	14.24
Average	13.66		13.53

The butter in churn 1 was packed in four sixty-pound tubs. These tubs were placed in a refrigerator at a temperature of 35 degrees F., and 24 hours later a trier full of butter was taken from each tub for analysis.

The water content was as follows:

Samples from tub 1, 13.68; tub 2, 13.00; tub 3, 13.52, and tub 4, 13.07 percent.

Twenty days later these four tubs were taken out of the refrigerator and placed in the churn room. The following day when the samples were taken the condition of the butter was similar to that sampled on the market. From each package five samples of butter were removed by means of a trier.

Table 1—Water Content, Percent. Samples Taken from Four Different Tubs of the Same Churning.

Sample No.	Tub 1	Tub 2	Tub 3	Tub 4
1	13.66	13.24	13.71	12.54
2	13.59	12.47	13.46	12.65
3	13.46	13.07	13.27	13.08
4	13.37	13.15	13.52	12.88
5	13.67	12.76	12.99	12.86
Average	13.55	12.94	13.39	12.80

The average water content in the 20 samples taken from the four tubs was 13.17 percent; highest 13.71 and lowest 12.47 percent.

Several churnings were handled in a manner to give variation in the composition of the butter. Samples were then taken by means of a spatula from various portions of the churn and placed in separate sample jars.

The following is an example of two consecutive churnings showing variation in composition of samples of butter from the same churn.

Table 2—Variation in Nine Samples from Same Churn.

Churn 1, High water					Churn 2, Low water			
Sample No.	Percent				Percent.			
	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
1	15.87	79.35	3.81	0.97	14.76	82.29	2.17	0.78
2	16.36	78.17	4.43	1.5	14.32	82.72	2.40	0.56
3	15.43	79.87	3.72	1.07	14.23	82.75	2.28	0.74
4	16.41	78.56	4.17	0.86	14.83	81.96	2.63	0.58
5	16.11	78.98	4.15	0.75	14.39	82.57	2.26	0.78
6	16.77	77.86	4.55	0.82	14.95	81.77	2.24	1.04
7	15.60	79.02	4.41	0.97	14.51	82.33	2.09	1.14
8	15.47	79.79	3.62	1.12	14.36	82.59	2.07	0.98
9	15.48	79.68	3.88	0.96	13.84	83.33	1.96	0.87
Average	15.94	79.00	4.08	0.95	14.47	82.48	2.23	0.82

A sample made by taking butter from various places in the churn is fairly representative of the butter in question and the analysis of such a sample is a fair approximation of its chemical content.

Composition of Half-Worked and Worked Butter.

It has been the practice for some time to work the butter continuously to the extent of 12 revolutions in the Victor churn and 18 in the Disbrow. When the butter had been worked 6

revolutions in the Victor churn and 9 in the Disbrow it was considered half worked.

In twenty-three consecutive churnings when the butter was half worked a sample was taken by means of a spatula from several places in the churn. A sample was also taken, in like manner, when the butter in the same churn was completely worked.

Table 3—Water in Half Worked and Worked Butter.

Churn No.	Percent of water		Churn No.	Percent of water		Churn No.	Percent of water	
	Half worked butter	Worked butter		Half Worked butter	Worked butter		Half worked butter	Worked butter
1	15.14	15.27	9	13.22	13.40	17	13.38	14.05
2	13.76	14.27	10	13.99	13.27	18	13.17	13.30
3	14.51	13.24	11	13.51	13.76	19	13.41	13.64
4	13.92	13.41	12	13.60	13.22	20	13.17	13.30
5	13.41	13.73	13	14.19	13.64	21	14.48	13.74
6	13.41	14.18	14	14.16	13.68	22	13.49	13.39
7	13.17	13.60	15	13.66	13.79	23	14.38	13.53
8	13.17	13.60	16	14.08	14.03			
Average	.....	.....		.....	.....		13.76	13.70

The variation was no greater than if the two samples had been taken from the worked butter.

Change in Composition Made by Each Revolution in Working.

Five consecutive churnings were used in this experiment. The samples of butter in each case were taken as uniformly as possible. Sample No. 1 was taken when the butter had been worked to the extent of 3 revolutions of the churn and sample No. 10 when worked 12 revolutions.

Table 4. Composition of Samples Taken After Each Revolution.

Sample No.	Revolutions	Churn 1 Percent			Churn 5 Percent				
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
1	3	13.92	83.82	1.58	0.68	13.38	83.30	2.51	0.81
2	4	14.31	83.26	1.71	0.72	13.66	82.61	2.92	0.81
3	5	14.17	83.58	1.53	0.72	13.41	83.41	2.57	0.81
4	6	14.59	83.07	1.73	0.51	13.26	83.13	2.72	0.87
5	7	14.67	82.81	1.68	0.84	13.66	82.67	2.83	0.82
6	8	14.84	82.77	1.62	0.77	13.41	83.02	2.78	0.79
7	9	14.26	83.51	1.54	0.69	13.82	82.40	2.81	0.97
8	10	14.75	82.79	1.62	0.84	13.63	82.63	2.81	0.93
9	11	14.24	83.41	1.56	0.79	13.97	82.32	2.89	0.82
10	12	14.94	82.72	1.67	0.67	13.63	82.71	2.92	0.74
Ave....		14.48	83.17	1.62	0.72	13.58	82.79	2.78	0.84
Granular		16.87	82.43	0.06	0.64	17.12	81.78	0.46	0.64
Highest.....						13.97	83.41	2.92	0.97
Lowest.....						13.26	82.32	2.51	0.74

Average Composition of the Samples Obtained from the Five Churnings.

14.36	82.03	2.70	0.88
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Average of the Highest Samples from Each Churning.

14.90	82.89	2.93	1.09
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Average of the Lowest Samples from Each Churning.

13.74	81.46	2.44	0.70
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In all of these five churnings the variation in composition of the samples taken from each revolution of churn showed no greater difference than if all had been taken from the finished butter.

Table 5. Composition of Samples Taken from Upper, Middle, and Lower End of Churn, Percent.

Date	Upper End			Middle			Lower End		
	Water	Fat	Salt	Water	Fat	Salt	Water	Fat	Salt
Nov. 27	14.45	81.20	2.87	14.89	80.59	3.66	14.92	81.12	3.10
	14.96	80.55	3.63	14.88	80.52	3.77	15.02	81.26	2.99
Average	14.71	80.88	3.25	14.89	80.56	3.71	14.97	81.19	3.05

Nov. 29	13.35	82.92	2.89	13.07	83.50	2.85	13.86	82.47	2.93
	12.78	83.61	2.78	13.19	83.16	2.88	13.43	82.94	2.79
	13.24	82.95	2.92	12.75	83.81	2.73	12.77	83.64	2.69
Average	13.12	83.16	2.86	13.00	83.49	2.82	13.28	83.02	2.80
Nov. 30	15.45	81.05	3.59	14.38	81.18	3.49	14.43	81.09	3.57
	15.02	80.37	3.84	14.03	81.73	3.39	14.76	80.28	3.93
	14.92	80.45	3.77	15.01	80.34	3.62	14.47	80.93	3.71
Average	15.13	80.62	3.77	14.48	81.08	3.50	14.55	80.77	3.73
Dec. 2	15.48	79.17	4.32	13.56	80.89	4.66	14.84	79.19	5.09
	14.93	80.02	4.03	14.53	79.41	4.89	14.52	79.44	4.98
	15.38	79.02	4.40	14.21	79.87	4.89	15.26	78.34	5.06
Average	15.26	79.40	4.25	14.10	80.06	4.81	14.87	78.99	5.04
Dec. 4	14.81	80.53	3.75	14.73	80.69	3.65	14.91	79.87	4.34
Dec. 9	13.55	84.57	1.39	13.34	84.48	1.30	13.96	83.93	1.34
	13.23	84.99	1.62	13.92	83.81	1.37	13.74	84.43	1.40
	13.51	84.30	1.39	14.09	83.57	1.45	13.92	83.88	1.34
Average	13.43	84.63	1.47	13.78	83.95	1.37	13.54	84.08	1.36
Gen. Av.....	14.41	81.54	3.22	14.16	81.64	3.31	14.35	81.32	3.39

Abnormal Butter.

Date	Upper end	Middle	Lower end	Date	Upper end	Middle	Lower end
	Water	Water	Water		Water	Water	Water
	20.06	20.24	20.40		23.71	22.33	22.83
Oct. 16	19.95	19.93	21.05	Nov. 19.	23.49	22.51	22.28
	20.27	19.96	20.67		23.51	22.72	22.88
Av.....	20.09	20.04	20.71		23.57	22.52	23.00

From the foregoing table it is seen that there are no special places in the churn where the butter is found differing uniformly from the average churn composition.

Composition of Butter Made in Two Different Churns.

The two churns used in this experiment were not of the same size but the amount of cream churned in each one was in proportion to the capacity. All the details in the operation of the two churns were as nearly alike as possible.

Table 6. Variation in Composition of Butter from Two Different Churns.
Comparison 1

Sample No.	Churn A Percent				Churn B Percent			
	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
1	12.83	84.55	1.77	0.85	15.85	80.82	2.68	0.85
2	13.17	84.15	1.85	0.83	14.82	82.10	2.36	0.72
3	14.10	83.15	2.06	0.69	14.82	82.00	2.33	0.85
4	13.13	84.15	1.87	0.85	15.67	81.01	2.59	0.73
5	12.85	84.57	1.82	0.76	13.62	83.58	1.97	0.83
6	13.74	83.54	1.89	0.83	14.65	82.25	2.19	0.91
7	13.40	84.02	1.88	0.70	14.55	82.30	2.20	0.95
8	13.39	84.02	1.56	1.03	14.88	81.99	2.54	0.67
9	13.69	83.60	1.98	0.73	14.61	82.13	2.22	1.04
10	13.08	84.18	1.85	0.89	14.77	82.17	2.21	0.85
Av....	13.34	83.99	1.85	0.81	14.82	82.00	2.33	0.84
Highest	14.10	84.57	2.06	1.03	15.85	83.58	2.68	1.04
Lowest	12.83	83.15	1.56	0.69	13.62	80.82	1.97	0.67

Comparison 2.

Sample No.	Churn A Percent				Churn B Percent			
	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
1	13.14	83.57	2.45	0.84	14.49	82.15	2.45	0.94
2	13.85	82.69	2.57	0.89	15.42	80.69	2.80	1.09
3	14.04	82.62	2.69	0.85	14.62	81.74	2.73	0.86
4	13.04	83.75	2.32	0.89	15.01	80.99	3.08	0.92
5	13.58	82.98	2.47	0.97	14.73	81.36	2.88	1.03
Av	13.53	....	2.50	0.85	14.85	81.38	2.79	0.97
Highest	14.04	....	2.69	0.97	15.42	82.15	3.08	1.09
Lowest	13.04	....	2.32	0.85	14.49	80.69	2.45	0.86

Average of Each of the Five Comparisons.

Comparison	Churn A Percent				Churn B Percent			
	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
1	13.34	83.99	1.85	0.81	14.82	82.00	2.33	0.84
2	13.53	83.12	2.50	0.85	14.85	81.88	2.79	0.97
3	13.50	83.44	2.04	1.00	14.83	82.52	1.74	0.90
4	13.40	82.69	3.00	0.91	14.65	81.68	2.79	0.88
5	14.04	83.01	2.24	0.70	15.09	81.10	3.10	0.71
Av	13.56	83.25	2.30	0.85	14.84	81.73	2.55	0.86

Only two comparisons are given entire, but the average for the other three are included in the final average.

Composition of Butter as Influenced by Time the Cream is Held at Churning Temperature.

During the months of May and June, 1907, a series of experiments were carried on, in which butter made from cream held one to three hours was compared with butter made from the same grade of cream held twelve to fifteen hours at churning temperature. Twenty-six vats of cream were used, making a total of fifty-two churnings. One tub of butter was packed from each of the first four churnings, while two tubs were packed from each of the other forty-eight. Samples of butter were taken for analysis from the churn and from the tub before and after storage.

Table 7. Composition of Butter as Influenced by Time the Cream is Held at Churning Temperature—26 Churnings.

	Butter in the churn			Samples taken from Fifty tubs before storage			Same tubs After storage		
	Percent			Percent			Percent		
	Water	Fat	Salt	Water	Fat	Salt	Water	Fat	Salt
From cream held 1 to 3 hours..	13.86	82.32	3.08	12.99	83.39	2.91	12.04	84.56	2.63
From cream held 12 to 15 hours..	13.83	82.59	2.82	12.83	83.85	2.57	11.88	85.01	2.33

This table indicates that the length of time the cream is held at churning temperature is not a factor in controlling composition.

Composition of Butter from Pasteurized and Unpasteurized Cream.

A series of experiments were carried on in 1907 and 1908 to determine the relation of pasteurization to quality of butter. The first year the butter from twenty-six churnings of pasteur-

ized cream was compared with the butter made from the same number of churnings of unpasteurized cream.

In the fourteen comparisons the cream for each day's experiment was all mixed in one vat, one-half of this was pasteurized and placed in a ripner, the other half was placed in the ripener, unpasteurized. For two days, the cream in each ripener was churned in a single churning. On the other twelve days the cream in each ripener was divided and churned in two churnings, making a total of four churnings each day for twelve days and two churnings a day for two days.

Two tubs of butter were packed from each churning, making a total of 104 tubs for the two lots, or 52 tubs of butter made from pasteurized cream. Samples for analysis were taken from the churn and from the tubs before and after storage. The averages of the results obtained by analyzing these samples are shown in the following table:

Table 8. Composition of Butter Made from Pasteurized and Unpasteurized Cream—26 Churnings Each.

	Unpasteurized			Pasteurized		
	Samples taken from			Samples taken from		
	Churn	52 tubs before storage	Same tubs after storage	Churn	52 tubs before storage	Same tubs after storage
Water..	14.42	13.31	12.24	13.63	12.66	11.76
Fat....	81.67	82.99	84.39	82.69	83.98	85.04
Salt....	3.06	2.87	2.56	2.98	2.61	2.39

The butter fat in each individual sample taken from tub, before storage, is also recorded in Table 18.

The above table also indicates the change in composition due to the length of time the butter was held before samples were taken.

In 1908, samples of butter for analysis were taken from forty churnings, made from pasteurized cream. Twenty of these churnings were made to contain a high percent of water and low percent of fat. In the other twenty churnings the butter contained low water and high fat. For churning record see Table 12.

Twenty-four hours after churning, the samples of butter were taken from four tubs packed from each churn, making a total of 80 samples taken from tubs of pasteurized butter, containing high water and low fat, and 80 from butter of a low water and high fat content. Samples were again taken from the butter in two of these tubs from each churning after six or seven months in storage. In like manner, samples were taken from the butter made from corresponding lots of unpasteurized cream.

Results of analyzing each of these samples are recorded in Table 13. Samples from churn 1, tubs 201 and 203, 401 and 403 before storage, and tubs 201 and 203 after storage, represent high water and low fat butter; churn 2, tubs 202, 204, 402 and 404 before storage, and 202 and 204 after storage represent the low water and high fat butter made from the same vats of cream pasteurized. Churn 3, tubs 205, 207, 405 and 407 before storage, and 205, 207 after storage; churn 4, tubs 206, 208, 406 and 408 before storage, and 206, 208, after storage represent the high water and low fat, and low water and high fat butter from unpasteurized cream. Each division of four churns represents a complete comparison.

Table 9 gives the comparison of the water, fat, and salt content separately for the two kinds of butter made from pasteurized and unpasteurized cream.

Table 9. Influence of Pasteurization of Cream upon Composition of Butter.

Comparing the Butter on basis of Percent of Water in the High Water and Low Fat Content Butter—20 Churnings.

Churn No.	Samples taken from churn		Unpasteurized	Samples taken from 4 tubs before storage		Samples taken from 2 of these tubs after storage	
	Pasteurized	No.		Pasteurized	Unpasteurized	Pasteurized	Unpasteurized
1	15.28	3	14.23	13.61	12.99	13.58	12.33
5	14.98	7	14.71	13.98	13.71	13.17	12.86
9	15.19	11	15.51	14.31	14.95	14.04	13.56
13	15.57	15	16.05	14.56	14.62	13.38	13.56
17	15.05	19	15.13	13.95	13.84	13.23	13.38
21	15.26	23	14.93	14.03	13.91	13.68	13.05
25	15.52	27	15.78	15.30	14.03	15.33	13.67

9	.....	15.04	3	14.62	14.19	14.89	14.04	13.38
33	.....	15.04	35	14.95	14.71	14.50	13.82	13.97
37	.....	16.13	39	14.88	15.53	13.90	14.75	12.41
41	.....	16.64	43	15.37	16.12	15.35	14.39	14.35
45	.....	15.66	47	15.44	14.77	14.81	14.25	13.84
49	.....	15.73	51	15.74	15.25	14.95	14.52	14.97
53	.....	15.55	55	14.59	15.33	14.33	14.13	13.26
57	.....	15.74	59	16.54	15.58	15.72	13.86	13.32
61	.....	16.06	63	15.49	15.68	15.13	14.29	13.33
65	.....	16.15	67	15.15	15.42	15.06	14.55	13.51
69	.....	15.85	71	14.94	15.38	14.62	13.75	12.84
73	.....	14.52	75	14.21	15.01	14.27	13.30	12.73
77	.....	15.15	79	15.22	14.87	14.49	13.93	13.35
Av	....	15.50		15.12	14.87	14.49	13.93	13.35
Dif.	.....	0.38			0.38		0.58	

Table 9—Continued.

Percent of Water in Low Water and High Fat Content Butter—20 Churnings.

Churn No.	Samples taken from churn			Samples taken from 4 tubs before storage		Samples taken from 2 of these tubs after storage	
	Pasteur- ized	Churn No.	Unpas- teurized	Pasteur- ized	Unpas- teurized	Pasteur- ized	Unpas- teurized
2	13.09	4	12.75	12.25	11.69	11.16	11.13
6	13.09	8	13.97	12.34	12.49	11.51	11.34
10	12.87	12	14.42	12.17	12.39	11.30	12.63
14	13.29	16	13.87	12.20	12.69	11.77	11.71
18	12.80	20	13.22	11.82	12.17	11.41	11.48
22	13.10	24	13.43	12.16	12.52	11.61	11.48
26	13.30	28	14.15	12.76	13.35	11.39	11.53
30	12.97	32	13.24	12.54	12.98	11.36	11.63
34	12.26	36	13.20	12.09	12.64	11.46	11.80
38	12.88	40	13.37	12.21	11.23	11.28	10.88
42	12.69	44	12.59	12.10	13.15	10.56	12.01
46	13.50	48	13.32	12.30	11.96	11.17	10.06
50	13.89	52	13.31	12.97	12.84	12.03	11.74
54	13.22	56	13.31	13.26	12.90	11.86	13.01
58	13.01	60	13.48	12.65	13.12	11.65	12.26
62	14.49	64	13.39	13.70	13.18	12.25	11.89
66	14.14	68	12.94	13.16	12.92	11.79	11.32
70	13.59	72	13.21	12.87	12.95	11.68	11.45
74	12.80	76	13.08	12.55	12.75	11.35	11.53
78	13.59	80	13.19	13.76	13.51	12.02	12.11
Av. . .	13.22		13.42	12.59	12.52	11.53	11.67
Dif.			0.20	0.07			0.14

Table 9—Continued.

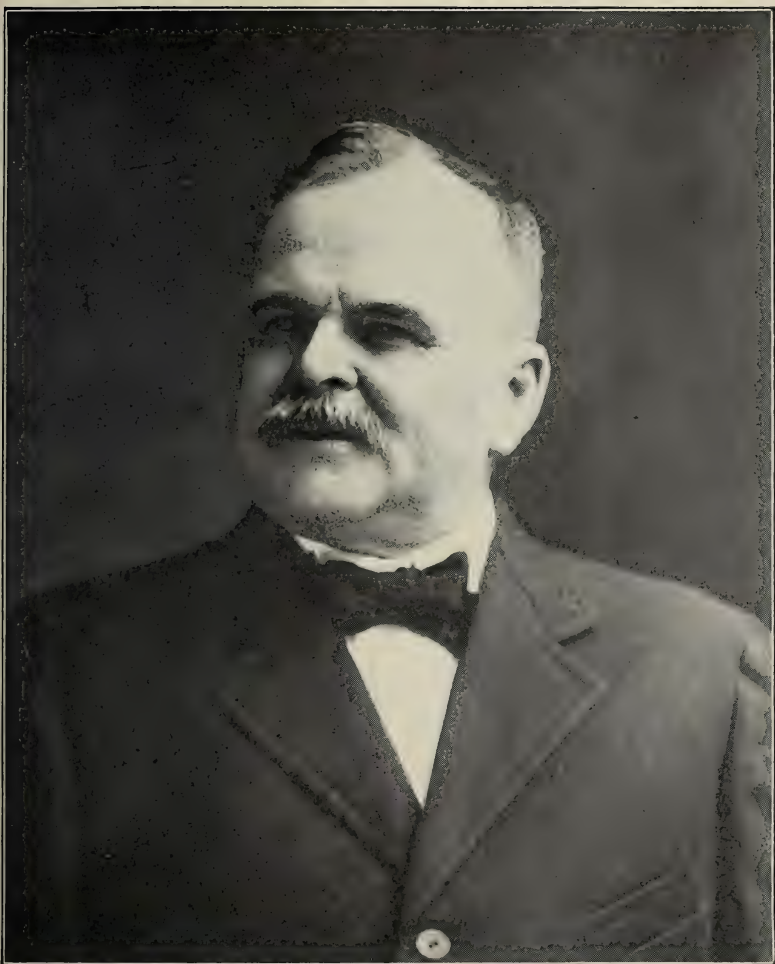
Comparing the butter on the Basis of Percent of Fat in the High Water and Low Fat Content Butter.

Churn No.	Samples taken from churn		Unpasteurized	Samples taken from 4 tubs before storage		Samples taken from 2 of these tubs after storage	
	Pasteurized	Churn No.		Pasteurized	Unpasteurized	Pasteurized	Unpasteurized
1	80.81	3	82.66	83.24	84.29	83.04	84.97
5	81.03	7	82.12	82.58	83.02	83.44	84.08
9	80.51	11	80.42	82.13	81.16	82.20	82.85
13	80.06	15	80.33	81.43	82.13	82.63	83.25
17	80.42	19	80.63	81.93	82.23	82.61	82.84
21	81.15	23	82.12	82.84	83.50	83.08	84.34
25	81.25	27	80.75	81.47	82.91	82.61	83.33
29	80.88	31	82.52	81.98	82.16	82.12	83.96
33	81.38	35	82.31	81.59	82.80	82.79	83.30
37	80.06	39	81.98	81.07	83.40	82.00	84.93
41	79.59	43	81.60	80.40	81.72	82.38	82.74
45	80.89	47	81.60	81.88	82.29	82.41	83.23
49	80.29	51	80.42	80.94	81.51	81.63	81.24
53	81.61	55	82.83	81.84	83.19	83.24	84.40
57	81.05	59	79.18	81.03	80.11	83.03	83.12
61	80.39	63	81.38	80.73	81.89	82.51	83.80
65	80.67	67	82.02	81.23	82.31	82.52	83.98
69	81.02	71	82.22	81.19	82.48	83.59	84.78
73	82.67	75	81.89	81.79	81.84	81.13	83.79
77	82.26	79	83.46	82.27	82.02	84.02	85.02
Av... ..	80.89		81.62	81.68	82.35	82.80	83.69
Dif.....			0.73		0.67		0.89

Table 9—Continued.

Percent Fat in the Low Water and High Fat Content Butter.

Churn No.	Samples taken from churn		Unpasteurized	Samples taken from 4 tubs before storage		Samples taken from 2 of these tubs after storage	
	Pasteurized	Churn No.		Pasteurized	Unpasteurized	Pasteurized	Unpasteurized
2	83.17	4	84.04	84.33	85.59	85.65	86.19
6	83.66	8	82.62	84.73	84.69	85.58	86.04
10	84.15	12	82.24	85.01	83.82	86.02	84.52
14	83.82	16	83.61	85.26	85.03	85.71	86.21
18	84.60	20	84.02	85.85	85.33	86.30	86.11
22	84.46	24	84.22	85.72	85.50	86.17	86.48
26	84.25	28	82.91	85.00	84.01	86.37	86.07



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30	84.65	32	84.34	84.97	84.67	86.40	86.30
34	85.52	36	84.18	85.68	84.92	86.44	85.87
38	84.18	40	83.25	85.13	84.83	86.16	86.45
42	84.57	44	83.58	85.34	84.19	86.97	84.87
46	83.11	48	83.13	84.66	84.72	85.93	87.02
50	81.06	52	84.10	82.47	84.61	83.71	85.75
54	84.44	56	84.36	84.38	84.84	85.85	84.52
58	84.57	60	83.70	84.93	84.09	85.81	84.85
62	82.18	64	83.85	83.15	84.04	84.79	85.54
66	82.23	68	84.42	83.69	84.48	85.29	86.46
70	83.59	72	84.07	84.52	84.41	85.96	86.12
74	84.42	76	84.58	84.87	85.06	86.42	86.31
78	83.85	80	84.64	83.57	84.66	85.81	85.85
Av....	83.82		83.79	84.66	84.67	85.83	85.87
Dif....	0.03				0.01		0.04

Table 9—Continued.

Comparing the Butter on the Basis of Percent of Salt in the High Water and Low Fat Content Butter.

Churn No.	Samples taken from churn		Samples taken from 4 tubs before storage		Samples taken from 2 of these tubs after storage	
	Pasteurized	Churn No. Unpasteurized	Pasteurized	Unpasteurized	Pasteurized	Unpasteurized
1	2.77	3 2.10	2.25	1.78	2.59	1.79
5	2.81	7 2.37	2.56	2.13	2.71	1.88
9	2.97	11 3.00	2.53	2.74	2.87	2.72
13	3.24	15 2.61	3.06	2.36	3.02	2.26
17	3.54	19 3.28	3.14	2.98	3.30	2.97
21	2.65	23 2.03	2.39	1.91	2.51	1.84
25	2.33	27 2.45	2.31	2.15	2.27	2.18
29	3.03	31 1.75	2.91	2.06	3.10	1.78
33	2.65	35 1.82	2.85	1.77	2.58	1.81
37	2.58	39 2.05	2.46	1.77	2.46	1.79
41	2.72	43 2.07	2.47	2.30	2.47	2.08
45	2.82	47 2.35	2.56	2.04	2.51	2.03
49	2.91	51 2.94	2.79	2.61	2.93	2.85
53	2.04	55 1.77	1.89	1.61	1.72	1.46
57	2.51	59 3.50	2.29	3.14	2.18	2.73
61	2.59	63 2.33	2.62	2.17	2.30	1.71
65	2.27	67 1.85	2.10	1.61	1.91	1.58
69	2.19	71 1.99	2.15	1.76	1.71	1.52
73	1.97	75 3.12	2.00	2.91	1.76	1.65
77	1.69	79 1.63	1.58	1.51	1.40	1.29
Av...	2.61	2.35	2.45	2.16	2.40	2.05
Dif.....	0.26		0.29		0.35	

Table 9—Continued.

Percent of Salt in the Low Water and High Fat Content Butter.

Churn No.	Samples taken from churn		Unpas- teurized	Samples taken from 4 tubs before storage		Samples taken from 2 of these tubs after storage	
	Pasteur- ized	Churn No.		Pasteur- ized	Unpas- teurized	Pasteur- ized	Unpas- teurized
2	2.82	4	2.21	2.45	1.84	2.48	1.92
6	2.30	8	2.10	2.12	1.92	2.20	1.76
10	2.18	12	2.13	1.92	1.77	1.97	1.94
14	2.03	16	1.78	1.90	1.51	1.93	1.38
18	1.76	20	1.93	1.65	1.64	1.66	1.58
22	1.65	24	1.54	1.58	1.59	1.61	1.30
26	1.68	28	2.01	1.66	1.82	1.58	1.56
30	1.67	32	1.47	1.78	1.56	1.54	1.28
34	1.39	36	1.60	1.71	1.75	1.42	1.49
38	1.93	40	2.26	1.91	1.99	1.75	1.83
42	2.05	44	1.81	2.02	1.67	1.79	1.82
46	2.75	48	2.86	2.17	2.32	2.09	2.00
50	3.90	52	1.85	3.65	1.66	3.36	1.63
54	1.79	56	1.68	1.57	1.68	1.50	1.56
58	1.93	60	2.21	1.78	2.02	1.75	2.02
62	2.68	64	2.05	2.41	1.86	2.09	1.67
66	2.69	68	1.88	2.31	1.71	2.07	1.42
70	1.98	72	1.80	1.78	1.58	1.58	1.54
74	1.78	76	1.55	1.70	1.68	1.50	1.28
78	1.77	80	1.41	1.66	1.59	1.37	1.23
Av.....	2.14		1.91	1.91	1.71	1.86	1.61
Dif.....	0.23			0.26		0.25	

Table 10. General Summary of Preceding Table.

Pasteurized---40 churnings					Unpasteurized---40 churnings			
Samples taken from					Samples taken from			
		160 tubs	80 tubs			160 tubs	80 tubs	
		Churn	before storage	after storage	Churn		before storage	after storage
High Water and Low Fat Content Butter.								
Percent	water....	15.50	14.87	13.93	15.12	14.49	13.35	
Percent	fat.....	80.89	81.68	82.80	81.62	82.35	83.69	
Percent	salt.....	2.61	2.45	2.40	2.35	2.16	2.05	

Difference Between Pasteurized and Unpasteurized Butter.

Percent water.....	.....	.....	.....	0.38	0.38	0.58
Percent fat.....	0.73	0.67	0.89	.....	.....	.....
Percent salt.....	.....	.....	.....	0.26	0.29	0.35

Low Water and High Fat Content Butter.

Percent water.....	13.22	12.59	11.53	13.42	12.52	11.67
Percent fat.....	83.82	84.66	85.83	83.79	84.67	85.87
Percent salt.....	2.14	1.97	1.86	1.91	1.71	1.61

Difference Between Pasteurized and Unpasteurized Butter.

Percent water.....	0.20	.....	0.14	.....	0.07	.....
Percent fat.....	.....	0.01	0.04	0.03	.....	.....
Percent salt.....	.....	.....	.....	0.23	0.26	0.25

The unpasteurized butter in 1907 showed a higher water and lower fat content than did the butter from pasteurized cream. In 1908 when methods were employed that should give high and low water respectively, the butter from pasteurized cream contained higher water than the butter from unpasteurized cream. When the method was changed and butter containing high fat and low water was made there was little or no difference in the analysis of pasteurized and unpasteurized butter.

While averages would lead one to draw these conclusions there is no apparent regularity of distribution caused by churning either pasteurized or unpasteurized cream.

The foregoing Table is an excellent indication of what may be secured in uniformity of composition of butter from separate churnings, for with few exceptions, any of the above samples might have been one of ten taken from the same churning.

Influence of Dry and Wet Salting Upon Composition.

Dry salting is the term applied to the usual method of salting butter. After the butter in the churn has been washed and the water allowed to drain the dry salt is then sprinkled uniformly over the surface.

Wet salting as here referred to is the method that has been used by this station during the past two years. It differs from the so-called dry salting system in that more salt is required and a definite amount of water per pound of butter in the churn is also added. In either case the rate of salt used per pound of butter does not determine the percent of salt retained in the finished product. Dry salting presupposed that some of the wash water is retained. This, however, is never constant nor in proportion to the amount of butter in the churn, hence, it is a factor largely responsible for lack of uniformity of salt content obtained by this method. A certain amount of water in the churn during working is necessary to aid in dissolving the salt. If this amount is not in proportion to the butter in the churn it will influence the amount of salt retained. For example, if 30 pounds of water should be left in the churn with the 200 or 600 pounds of butter and in either case salt added, at the rate of one ounce per pound of butter, it is natural that the butter in the 600 pound churn would contain the highest percent of salt, since a smaller percent of the salt is wasted in the form of brine, as previously stated.

By the wet method of salting, the butter is thoroughly drained and a definite amount of salt and water is added per pound of butter.

Thoroughly draining the butter, in a measure, overcomes the uncertain amount of water retained in the churn and leaves the relation of salt, butter, and water more definite.

An example of this method of salting is recorded in Table 12. The question naturally arises: What influence does this additional amount of water in the churn, while the butter is being worked, have upon the water and fat content?

This method of salting had been in use for some time before it was experimentally compared with dry salting on alternate days. This comparison did not indicate that the method of salting bore any direct relation to the intended water content. A year, or more, later comparisons were made on six consecutive days by dividing all of the cream in the ripener into two churn-

ings. Care was taken to eliminate all other influencing factors. In each series the butter was allowed to drain alike. To one churn was added one ounce of salt per pound of estimated butter and to the other two ounces of salt and two and one-half ounces of water per pound. The estimated butter was based upon pounds of butter fat churned allowing one-sixth for overrun.

Table 11. Churn Record to Show Influence of Dry and Wet Salting on Composition Butter.

Pounds					Percent			
Churn No.	Cream	Butter fat	Salt added	Water added	Brine left in churn	Water	Fat	Salt
1.....	1016	243.8	33.5	51	78	15.05	81.80	2.32
2.....	923	226.3	16.5	not any	35	14.43	91.30	3.42
3.....	735	180.7	26.2	33	77	14.58	82.40	2.11
4.....	729	174.9	12.7	not any	37	14.94	82.26	2.01
5.....	807	229.8	16.5	not any	..	14.96	81.81	2.43
6.....	797	227.3	33.0	41	..	14.41	81.91	2.38
7.....	815	216.0	15.7	not any	22	14.33	82.14	2.78
8.....	740	196.1	28.6	36.6	60	13.73	82.38	3.19
9.....	700	189.0	27.5	34.5	82	14.46	82.35	2.41
10.....	690	186.0	13.7	not any	28	14.33	82.93	1.94
11.....	713	128.3	9.7	not any	50	13.73	84.53	0.93
12.....	651	117.8	17.1	21	62	14.05	83.42	1.80

In looking over these results there is a marked degree of uniformity in the water content, in fact, the variation would be no greater had all of the samples been taken from any one of the churnings. This is not so true of the fat and salt. In all the work that has previously been done at this station in studying composition, the data show that if a fixed percent of water is desired it can be obtained regardless of the amount of salt retained in the butter; that is to say, there is no relation between water and salt content. Casine also remains quite constant. It must therefore be noted that if butter is made having a high or low salt content there must be a corresponding decrease or increase in fat content. Butter having 15 percent of water can be made regardless of whether the operator intends 1 or 5 percent of salt. Comparing the dry and wet salted butter for each day there is no great difference. The two lots of butter made in churnings

11 and 12 contained a much lower salt content due to the small amount of butter worked, in proportion to salt added, and excessive amounts of the wash water that was drained off, previous to salting. A comparatively uniform salt content can be maintained in various churnings of butter. The grains of salt can be distributed through the butter regardless of whether they will dissolve or not. This fact may seem insignificant, but it is not a safe policy to make butter even under favorable conditions unless due consideration is given to the dissolving of salt. There is a difference in salt grains; some pass into solution much more readily than others. However, this difference can be reduced to a minimum by having some free water with the butter in the churn at time of working.

It may be observed by looking over Table 12, Churning Record, that the percent of salt was not as uniform as might be desired. It is also true that the ratio of salt and water used was not the same throughout the experiment. In churn No. 75 an error was made in the salt calculation and was not discovered until the working was completed.

Influence of Temperature Upon Composition.

In connection with the regular investigation a large amount of data had been collected from time to time that might lead to some definite line of study on temperature as a factor influencing composition. Already some material had been obtained and was accumulating which gave temperature the most prominent place as a factor in controlling composition. Therefore it seemed advisable that a series of experiments be carried out on a large enough scale to furnish data comparable with practical creamery conditions. In connection with the work done in 1908 on comparing butter made from pasteurized and unpasteurized cream the pasteurized cream for each day was placed in a 200 gallon cream ripener; the remainder of the cream for each comparison was not pasteurized but placed in another ripener, thus giving two different lots of cream from which to also study composition.

The pasteurized cream in each of the 20 comparisons was always churned first, in two different churns, and the unpasteurized cream immediately after. In each comparison the cream in the two ripeners was handled to produce butter having a high water and low fat content. The remainder of the cream in each ripener was made into butter of a low water and high fat content. The salt in these four churns was kept as nearly uniform as possible. Churns were numbered in order from 1 to 80. The first churn for each experimental day always contained pasteurized cream to be made into butter of high water and low fat, and second churn filled with the same cream but to be made into the drier butter. Preceding data showed that different makes of churns had an influence on the water content and this fact was taken advantage of in making high and low moisture butter. The only other change made to produce the two lots of butter of different composition, was the temperature of the wash water. However, it would have been possible to have secured a wider variation had the other lines of experiment permitted a regulation of the temperature of the cream. The wash water was allowed to remain in the churn a sufficient length of time to adjust the temperature of the butter.

Table 12—Continued

	Pasteurized May 19]	Unpasteurized May 19]	Pasteurized May 22]	Unpasteurized May 22]	Pasteurized May 26]	Unpasteurized May 26]	Pasteurized May 29]	Unpasteurized May 29]
Weight of cream....	1100 598	1100 587	1100 566	1100 596	1100 589	1100 574	1100 570	1100 533
Percent fat	28.	28.	28.5	28.5	31.5	31.5	27.	27.
Pounds fat	167.4 308	164.4 308	313.5 161.3	313.5 169.8	346.5 185.5	346.5 180.8	297 154	297 144
Acidity	0.50	0.55	0.54	0.52	0.45	0.54	0.54	0.55
Temperature	54	52	52	53	50	52	50	52
Hours held cold....	3	5	3	5	6	4	6	4
Time to churn, min..	17	27	23	25	20	18	17	25
Wt. of buttermilk...	740	400	740	400	700	360	750	390
Pret. fat in br'mlk..	0.18	0.12	0.13	0.14	0.23	0.18	0.13	0.18
Lbs. fat in br'mlk...	1.33	0.88	0.96	0.53	1.61	0.85	0.97	0.70
Tem. in br'mlk.....	58	55	58	56	56	57	55	58
Weight wash water..	740	400	740	408	700	360	750	390
Temp. wash water..	60	47	60	47	58	48	48	58
Weight salt.....	44.9	24.4	44.9	21.8	44	23.7	44	20
Rate per lb. butter..	2 oz.	2 oz.	1 3/4	1 3/4	1 3/4	1 3/4	2 oz.	1 3/4
Weight water to salt	67.2	36	68	36	76	40.5	76	33 5/8
Rate per lb. butter..	3 oz.	3 oz.	3 oz.	3 oz.	3 oz.	3 oz.	3 oz.	3 oz.
No. times worked...	12	18	12	18	12	18	12	18
Temp. of butter.....	61	59	60	54	59	52	58	54
Weight of butter....	376	375.5	386	390	424	223	358	178
Percent overrun	22.1	15.3	23.1	22.4	22.3	20.2	20.5	15.6
Weight starter	(250)	(254)	(236)	(236)	(None)	(None)	(212)	(212)
Churn used.....	Victor	Victor	Victor	Victor	Victor	Victor	Victor	Victor
Churn number	17	19	21	23	25	27	29	31
Tub numbers	233	237	241	245	249	253	257	261
Tub numbers	235	239	243	247	251	255	259	263
Tub numbers	433	437	441	445	449	453	457	461
Tub numbers	435	439	443	447	451	455	459	461

Table 12—Continued

	Pasteurized June 2	Unpasteurized June 2	Pasteurized June 5	Unpasteurized June 5	Pasteurized June 9	Unpasteurized June 9	Pasteurized June 12	Unpasteurized June 12
Weight of cream....	1100 515	1100 509	1100 551	1100 571	1100 659	1100 666	1100 621	1100 580
Percent fat	32 32	32 32	32 32	32 32	32.5 32.5	32.5 32.5	32. 32.	32. 32.
Pounds fat	164.8 352	162.9 352	176.3 352	182.7 352	357.5 214.1	357.5 216.5	352 198.7	352 185.6
Acidity	0.46 0.46	0.50 0.50	0.52 0.52	0.57 0.57	0.50 0.50	0.54 0.54	0.43 0.43	0.49 0.49
Temperature	47 50	50 50	47 47	49 49	51 51	53 53	50 50	51 51
Hours held cold.....	3 3	5 5	3 3	5 5	3 3	5 5	3 3	5 5
Time to churn, min..	42 30	35 30	45 40	45 40	20 24	20 20	27 23	35 30
Wt. of buttermilk...	700 320	700 320	700 340	700 360	680 400	680 400	670 385	670 360
Pret. fat in br'mlk..	0.08 0.07	0.10 0.12	0.10 0.12	0.14 0.15	0.22 0.20	0.27 0.22	0.28 0.20	0.17 0.20
Lbs. fat in br'mlk..	0.56 0.22	0.70 0.38	0.70 0.40	0.98 0.54	1.49 0.80	1.83 0.88	1.87 0.77	1.14 0.72
Temp. of br'mlk....	54 57	57 57	54 56	56 56	56 56	57 57	56 56	56 56
Weight wash water..	700 320	700 320	700 340	700 360	680 400	680 400	670 385	670 360
Temp. wash water...	58 52	52 58	52 58	48 48	58 48	58 48	58 48	58 48
Weight of salt.....	45 21	21.5 45	25.5 45	36.6 45	45.5 31 1/4	45.5 31 1/4	45 29	45 27
Rate per lb. butter ..	1 3/4 36	1 3/4 35.5	1 3/4 39	2 oz. 77	2 oz. 78	2 oz. 78	2 oz. 77	2 oz. 77
Wt. water to salt...	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12
Rate per lb. butter...	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12	3 oz. 12
No. times worked....	12 49	57 53	56 55	59 54	58 50	58 53	58 52	58 51
Temp. of butter.....	432.5 196	426 192.5	433 210.5	421 214	453 255.5	438 265.5	428 237	432.5 221.5
Weight of butter....	22.8 18.9	21 18.1	23. 19.4	19.6 17.1	26.6 19.3	22.5 22.7	21.4 19.2	22.8 19.3
Percent overrun ....	.....	(None)	(None)	(None)	(None)	(None)	(None)	(None)
Weight starter	(None)	(None)	(None)	(None)	(None)	(None)	(None)	(None)
Churn used.....	Victor Dishrow	Victor Dishrow	Victor Dishrow	Victor Dishrow	Victor Dishrow	Victor Dishrow	Victor Dishrow	Victor Dishrow
Churn numbers	33 34	35 36	37 38	39 40	41 42	43 44	45 46	47 48
Tub numbers	265 266	269 270	272 275	276 279	281 282	285 286	289 290	293 294
Tub numbers	267 268	271 272	275 276	277 280	283 284	287 288	291 292	295 296
Tub numbers	465 466	470 473	474 477	478 480	481 482	485 486	489 490	493 494
Tub numbers	457 468	471 472	475 476	479 480	483 484	487 488	491 492	495 496

Table 12—Continued

	Pasteurized June 16	Unpasteurized June 16	Pasteurized June 18	Unpasteurized June 18	Pasteurized June 19	Unpasteurized June 19	Pasteurized June 23	Unpasteurized June 23
Weight of cream.....	1100 557	1100 539	900 503	900 495	1100 616	1100 574	1100 616	1100 568
Percent fat	27.5	27.5	24.5	24.5	26.5	26.5	26.5	26.5
Pounds fat	302.5	302.5	220.5	220.5	291.5	291.5	291.5	291.5
Acidity	0.46	0.5	0.54	0.50	0.5	0.5	0.46	0.48
Temperature	49.5	49.5	49	50	51	48	50	50
Hours held cold.....	3	5	3	5	3	0	3	5
Time to churn, min....	45	50	27	25	30	30	35	30
Wt. of buttermilk....	725	730	635	635	750	750	750	760
Pret. fat in br'mlk....	0.28	0.15	0.15	0.15	0.17	0.25	0.20	0.24
Lbs. fat in br'mlk....	2.03	1.09	0.95	0.95	1.27	1.87	1.2	1.82
Temp. buttermilk....	56	57	58	57	58	57	58	55
Wt. of wash water....	725	730	635	635	750	750	750	760
Temp. wash water....	59	59.5	49	59	58	50	58	48
Weight of salt.....	45	22	32	17 3/4	43 1/4	43 1/4	43 1/4	43 1/4
Rate per lb. butter...	2 oz. 2 1/4 oz.	2 oz. 2 oz.	2 oz. 2 oz.	2 oz. 2 oz.	2 oz. 2 oz.	2 oz. 2 oz.	2 oz. 2 oz.	2 oz.
Weight water to salt	66	33.5	48	26	66	30	66	27.5
Rate per lb. butter...	3 oz.	3 oz.	3 oz.	3 oz.	3 oz. 2 1/2	3 oz. 2 1/2	3 oz. 2 1/2	3 oz.
No. times worked....	12	28	12	23	12	18	12	20
Temp. of butter.....	58	58	51	52	59	54	59	52
Weight of butter....	375	190	371	266	351	191	355	341
Percent overrun	24	22.6	17	20.1	20.4	17	21.7	16.9
Weight starter	(271)	(271)	(282)	(282)	(168)	(168)	(240)	(240)
Churn used.....	Victor	Victor	Victor	Victor	Victor	Victor	Victor	Victor
Churn number	49	51	53	54	57	58	61	63
Tub numbers	297	301	305	306	313	314	321	325
Tub numbers	299	303	304	308	315	316	323	327
Tub numbers	497	501	502	506	513	514	521	525
Tub numbers	499	503	504	508	515	516	523	527

Table 12 is a complete record of the method of making the 80 consecutive churnings of experimental butter, for comparison of pasteurized and unpasteurized cream, and of high and low water content butter. In making butter in a creamery the general method need vary but little from this, except in respect to temperature of the water used in washing and the amount of salt and water added at time of salting. This butter was made during the months of May and June. The temperature of the cream and the length of time it was held before churning gave results that were desirable. The temperature of the wash water was constant, depending upon composition intended in the butter. There was a difference in the general condition of the two lots of butter commensurate with the method of handling, but this difference was not sufficient to be detected when the butter was judged. The lots of butter made to contain the higher percent of water were rather soft when the working was completed and the low water butter very firm. This condition was due to the temperature of the wash water alone.

It is interesting to note that the sudden change of temperature in the butter, due to washing it with water at a much lower or a much higher temperature than that of the buttermilk, did not impair the finished workmanship. It was the unanimous opinion of the judges that the workmanship could not have been improved.

The range of temperature that should be employed in handling cream during the various stages until it is made into butter, cannot be stated definitely. The general method followed in Table 12 produces desirable results during the summer months in Illinois. The main change of temperature occurs as the season advances. This general method employed in salting the butter gives desirable results. The objection is that salt is wasted; however, it is not necessary that 2 ounces of salt and 3 ounces of water per pound of butter be the standard. The presence of a given amount of water in the churn to dissolve the salt reduces the possibility of mottles. Mr. F. A. Jorgensen, Field Instructor in Dairy Manufactures, has in his work in the creameries, used

less salt and water. This same method has been given a thorough trial in making butter in the University creamery and proves to be nearly as successful. In this method the amount of butter is estimated on the basis of butter fat in the cream plus one sixth for overrun. To every one hundred pounds of butter add 8 to 10 pounds of salt and 8 to 12 pounds of water. Mix the granular butter, salt and water by revolving the churn on slow gear ten revolutions, then work the usual amount.

The only reason for advocating the two different methods of salting butter is that the creamery operator may have some standard. However, the skilled operator needs no better method than the one he has followed for years.

In referring to churn 1 on May 6, it can be seen that the representative tubs packed were marked 201, 203, 401 and 403. These same tub numbers are used again in Table 13, also in Table 15, to show the amount of butter fat recovered in the butter made in churn 1. The first average in Table 17 represents the first four churnings in Table 12 and the first sixteen tubs sampled and reported in Table 13.

Samples for analysis were taken from the churn, from four tubs packed from each churning and from two of these tubs from each churning after storage.

It seemed best to give the results obtained by analyzing each sample together with averages in order that further data are furnished to show: (1) That uniformity of composition is possible regardless of the percent of water or fat intended to be put into the butter. (2) The sampling of four different tubs from the same churn does not always give samples having the same composition. (3) Variation in composition of butter when samples are taken from the butter in the churn and in the tubs before and after storage. It was not intended that butter with abnormally high, or with an illegal percent of water, be made, but a grade of butter that could be sold on any market.

The two lots of butter naturally did not have the same degree of firmness when packed into the tubs and the hard butter did not handle quite as well nor show as finished workmanship

as the soft butter but there was not enough difference to affect its market or general condition for judging.

The results obtained by studying influence of temperature are not abnormal. Butter fat does not at all seasons of the year respond alike to the same temperature. This is not new information since creamery operators have long had an adjustable scale of temperature to suit seasons of the year. There is no excuse for illegal butter in any locality. It is true, that there are minor influencing factors to be recognized, all of which may be controlled by temperature.

Table 13. Composition of Butter in Eighty Consecutive Churnings. When Samples are Taken from Churn; from Four Tubes from Each Churning Twenty-four Hours Later, and from Two of These Same Tubes After Six to Seven Months, in Storage.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
201	1	15.28	80.81	2.77	1.14	13.36	83.45	2.22	0.97	13.95	82.56	2.69	0.80
203						13.53	83.28	2.25	0.94	13.20	83.52	2.48	0.80
401						13.93	82.98	2.29	0.80				
403						13.62	83.27	2.24	0.87				
202	2	13.09	83.17	2.82	0.92	12.01	84.70	2.43	0.86	11.05	85.83	2.48	0.64
204						12.29	84.25	2.74	0.99	11.27	85.46	2.48	0.79
402						12.50	84.02	2.52	0.96				
404						12.20	84.37	2.39	1.04				
205	3	14.23	82.66	2.10	1.01	13.01	84.37	1.87	0.75	12.47	84.80	1.78	0.95
207						12.65	84.65	1.68	1.02	12.18	85.13	1.80	0.89
405						13.44	83.73	1.89	0.94				
407						12.87	84.43	1.68	1.02				
206	4	12.75	84.04	2.21	1.00	11.55	85.82	1.82	0.81	10.86	86.55	1.87	0.72
208						11.71	85.50	1.91	0.88	11.39	85.83	1.97	0.81
406						11.88	85.30	1.88	0.94				
408						11.63	85.72	1.74	0.91				
209	5	14.98	81.03	2.81	1.18	13.88	82.74	2.49	0.89	13.32	83.19	2.68	0.81
211						13.69	82.94	2.74	0.90	13.02	83.69	2.54	0.75
409						14.54	81.82	2.66	0.98				
411						13.70	82.85	2.63	0.82				
210	6	13.09	83.66	2.30	0.95	12.40	84.72	2.13	0.75	11.88	85.22	2.24	0.66
212						12.30	84.78	2.05	0.87	11.13	85.94	2.16	0.77
410						12.34	84.66	2.12	0.88				
412						12.32	84.76	2.17	0.75				
213	7	14.71	82.12	2.27	0.90	13.77	83.01	2.10	1.12	12.80	84.12	1.63	1.46
215						13.45	83.18	2.17	1.20	12.92	84.03	2.14	0.91
413						13.48	83.39	2.10	1.03				
415						14.16	82.51	2.14	1.19				
214	8	13.97	82.62	2.10	1.31	12.37	84.96	1.74	0.93	11.35	86.02	1.76	0.97
216						12.73	84.28	1.89	1.10	11.32	86.05	1.76	0.87
414						12.40	84.86	2.10	0.64				
416						12.84	84.66	1.96	0.90				
217	9	15.19	80.51	2.97	1.33	14.39	81.90	2.60	1.11	13.93	82.07	2.97	1.03
219						13.98	82.77	2.36	0.89	14.14	82.32	2.76	0.78
417						14.23	82.11	2.51	1.15				
419						14.62	81.74	2.66	0.98				

Table 13—Continued.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
218	10	12.87	84.15	2.18	0.80	12.57	84.61	2.08	0.74	11.10	86.28	1.91	0.71
220						12.08	85.14	1.89	0.89	11.49	85.76	2.02	0.73
418						12.17	84.93	1.87	1.13				
420						11.87	85.38	1.86	0.89				
221	11	15.51	80.42	3.00	1.07	14.98	81.02	2.86	1.14	14.01	82.16	2.87	0.96
223						15.03	81.09	2.71	1.17	12.95	83.54	2.57	0.84
421						14.93	81.21	2.66	1.20				
423						14.88	81.34	2.74	1.04				
222	12	14.42	82.24	2.13	1.21	13.36	83.86	1.80	0.98	12.94	84.12	2.04	0.90
224						13.51	83.53	1.84	1.12	12.31	84.96	1.83	0.90
422						13.32	83.95	1.71	1.02				
424						13.36	83.96	1.73	0.95				
225	13	15.57	80.06	3.24	1.13	14.13	82.03	3.02	0.82	13.46	82.63	3.09	0.80
227						14.29	81.88	2.67	1.16	13.29	82.60	2.95	1.16
425						14.15	81.89	3.00	0.96				
427						15.69	79.94	3.54	0.83				
226	14	13.29	83.82	2.03	0.86	12.11	85.52	1.86	0.51	11.77	85.85	1.92	0.66
228						11.93	85.54	1.87	0.66	11.76	85.77	1.94	0.53
426						12.42	85.00	1.91	0.67				
428						12.34	84.98	1.97	0.71				
229	15	16.05	80.33	2.61	1.01	14.08	82.86	2.22	0.84	13.96	82.83	2.36	0.85
231						14.45	82.38	2.28	0.89	13.35	83.67	2.15	0.83
429						14.92	81.80	2.45	0.83				
431						15.03	81.47	2.49	1.01				
230	16	13.87	83.61	1.78	0.74	12.24	85.58	1.51	0.67	11.88	86.07	1.42	0.71
232						12.47	85.32	1.44	0.77	11.62	86.35	1.34	0.69
430						13.02	84.64	1.59	0.75				
432						13.02	84.57	1.49	0.92				
233	17	15.05	80.42	3.54	0.99	14.03	81.77	3.19	1.01	13.03	82.90	3.14	0.93
235						13.60	82.38	3.00	1.02	13.43	82.31	3.45	0.81
433						13.94	81.97	3.16	0.93				
435						14.22	81.62	3.18	0.98				
234	18	12.80	84.60	1.79	0.84	12.04	86.10	1.58	0.28	11.39	86.29	1.67	0.65
236						11.63	85.59	1.66	1.02	11.42	86.30	1.64	0.64
434						11.89	85.86	1.72	0.71				
436						11.74	86.04	1.65	0.57				
237	19	15.13	80.63	3.28	0.96	13.99	82.05	3.00	0.96	13.57	82.57	3.05	0.81
239						13.72	82.35	2.94	0.99	13.19	83.11	2.88	0.82
437						13.93	82.18	3.04	0.85				
439						13.71	82.34	2.94	1.01				

Table 13—Continued.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
238	20	13.22	84.02	1.93	0.83	12.25	85.15	1.72	0.88	11.41	86.22	1.58	0.79
240						11.97	85.61	1.64	0.78	11.55	86.00	1.58	0.87
438						12.29	85	28	1.68	0.75			
440						12.17	85.31	1.52	1.00				
241	21	15.26	81.15	2.65	0.94	13.94	82.99	2.28	0.79	13.35	83.51	2.43	0.71
243						13.47	83.59	2.27	0.67	14.01	82.65	2.58	0.76
441						14.00	82.81	2.46	0.73				
443						14.70	81.98	2.56	0.76				
242	22	13.10	84.46	1.65	0.79	12.36	85.46	1.60	0.58	11.46	86.32	1.60	0.62
244						12.02	85.91	1.58	0.49	11.75	86.01	1.62	0.62
442						12.23	85.59	1.66	0.52				
444						12.06	85.93	1.47	0.54				
245	23	14.93	82.12	2.03	0.92	13.84	83.37	1.89	0.90	12.74	84.71	1.72	0.83
247						13.95	83.58	1.88	0.59	13.35	83.97	1.96	0.72
445						13.81	83.70	1.91	0.58				
447						14.04	83.35	1.96	0.65				
246	24	13.43	84.22	1.54	0.81	12.60	85.46	1.34	0.60	11.09	86.81	1.30	0.80
248						12.94	85.34	1.44	0.28	11.86	86.15	1.29	0.70
446						12.10	85.95	1.26	0.69				
448						12.47	85.26	1.32	0.95				
249	25	15.52	81.25	2.33	0.90	15.48	81.08	2.37	1.07	14.36	82.59	2.23	0.81
251						14.92	81.96	2.20	0.92	14.29	82.62	2.31	0.78
449						15.18	81.73	2.26	0.92				
451						15.62	81.11	2.41	0.86				
250	26	13.30	84.25	1.68	0.77	12.77	85.20	1.60	0.43	10.69	86.95	1.58	0.78
252						12.90	84.80	1.73	0.57	12.09	85.58	1.58	0.85
450						12.73	85.02	1.66	0.59				
452						12.63	85.01	1.65	0.71				
253	27	15.78	80.75	2.45	1.02	13.97	83.27	2.01	0.76	13.81	83.17	2.17	0.85
255						12.59	84.27	2.11	1.03	13.52	83.49	2.19	0.80
453						14.67	82.22	2.18	0.93				
455						14.88	81.91	2.29	0.92				
254	28	14.15	82.91	2.01	0.93	13.48	83.99	1.84	0.69	11.52	86.03	1.59	0.86
256						13.64	83.55	1.94	0.87	11.53	86.10	1.53	0.84
454						13.31	84.12	1.76	0.81				
456						12.99	84.40	1.75	0.86				
257	29	15.04	80.68	3.03	1.25	14.52	81.52	3.03	0.93	14.06	81.99	3.21	0.74
259						13.94	82.46	2.73	0.87	14.01	82.24	2.99	0.76
457						14.21	81.85	2.95	0.99				
459						14.08	82.09	2.93	0.90				

Table 13—Continued.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
258	30	12.97	84.65	1.67	0.71	12.71	84.81	1.84	0.64	11.48	86.26	1.53	0.73
260						12.32	85.29	1.64	0.75	11.23	86.53	1.54	0.70
458						12.34	85.10	1.64	0.92				
460						12.80	84.67	1.89	0.64				
261	31	14.62	82.52	1.76	1.10	14.53	82.71	1.90	0.86	13.49	83.90	1.85	0.76
263						15.17	81.69	2.21	0.93	13.26	84.01	1.73	1.03
461						14.93	82.05	2.05	0.97				
463						14.92	82.19	2.06	0.83				
262	32	13.24	84.34	1.47	0.95	12.59	85.23	1.50	0.68	11.35	86.70	1.27	0.68
264						13.09	84.35	1.69	0.87	11.90	85.90	1.29	0.91
462						13.11	84.55	1.39	0.95				
464						13.12	84.55	1.66	0.67				
265	33	15.04	81.38	2.65	0.93	14.68	81.75	2.78	0.79	13.81	82.76	2.61	0.82
267						14.75	81.59	2.79	0.87	13.82	82.81	2.54	0.83
465						15.38	80.73	3.12	0.77				
467						14.04	82.29	2.73	0.94				
266	34	12.26	85.52	1.39	0.83	12.14	85.58	1.49	0.79	11.51	86.28	1.44	0.77
268						12.29	85.42	1.53	0.76	11.41	86.59	1.40	0.60
466						12.00	85.78	1.46	0.76				
468						11.93	85.93	1.34	0.80				
269	35	14.95	82.31	1.82	0.92	14.78	82.66	1.78	0.78	13.96	83.37	1.78	0.89
271						14.47	82.79	1.81	0.93	13.97	83.23	1.83	0.97
469						14.84	82.30	1.82	1.04				
471						13.92	83.46	1.68	0.94				
270	36	13.20	84.18	1.60	1.02	12.42	85.22	1.51	0.85	11.82	85.82	1.47	0.89
272						12.47	85.07	1.54	0.92	11.77	85.91	1.51	0.81
470						12.72	84.81	1.34	1.13				
472						12.94	84.58	1.60	0.88				
273	37	16.13	80.06	2.58	1.23	15.57	80.98	2.22	1.23	14.43	82.35	2.39	0.83
275						15.26	81.43	2.37	0.94	15.06	81.64	2.52	0.83
273						15.69	80.87	2.60	0.84				
475						15.61	81.00	2.66	0.73				
274	38	12.88	84.18	1.93	1.01	11.85	85.41	2.01	0.73	11.16	86.18	1.81	0.85
276						12.20	85.24	1.75	0.81	11.42	86.14	1.69	0.75
474						12.38	84.93	1.95	0.74				
476						12.42	84.93	1.95	0.70				
277	39	14.88	81.98	2.05	1.09	13.73	83.64	1.54	1.10	12.03	85.37	1.71	0.89
279						13.92	83.31	1.83	0.94	12.78	84.49	1.86	0.87
477						14.00	83.35	1.83	0.82				
479						13.95	83.31	1.89	0.85				

Table 13—Continued.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
278	40	13.37	83.25	2.26	1.12	12.48	84.71	1.86	0.95	10.85	86.61	1.71	0.83
280						12.10	84.91	2.01	0.98	10.91	86.28	1.95	0.86
478						12.18	84.93	1.94	0.95				
480						12.06	84.76	2.18	1.00				
281	41	16.64	79.59	2.72	1.05	15.28	81.38	2.36	0.98	14.33	82.49	2.45	0.73
283						16.65	79.73	2.86	0.76	14.45	82.26	2.49	0.80
481						16.36	80.13	2.79	0.72				
483						16.21	80.36	2.67	0.76				
282	42	12.69	84.57	2.05	0.69	11.86	85.56	1.95	0.63	10.57	86.97	1.79	0.67
284						12.62	84.67	2.24	0.47	10.55	86.96	1.78	0.71
482						12.03	85.48	1.96	0.58				
484						11.90	85.66	1.92	0.52				
285	43	15.37	81.60	2.07	0.96	15.85	81.10	2.36	0.69	14.60	82.38	2.14	0.87
287						15.24	81.83	2.23	0.70	14.09	83.10	2.01	0.80
485						15.30	81.80	2.39	0.51				
487						15.03	82.14	2.19	0.64				
286	44	13.59	83.58	1.81	1.02	12.96	84.51	1.84	0.69	13.32	83.86	2.02	0.80
288						13.38	83.73	1.97	0.92	11.71	85.88	1.61	0.80
486						13.23	84.07	1.89	0.81				
488						13.03	84.45	1.89	0.63				
289	45	15.66	80.89	2.82	0.63	14.18	82.58	2.49	0.75	14.09	82.61	2.46	0.84
291						15.24	81.60	2.73	0.43	14.40	82.20	2.56	0.84
489						14.56	81.83	2.44	1.17				
491						15.10	81.52	2.59	0.79				
290	46	13.50	83.11	2.75	0.64	12.65	84.66	2.26	0.43	11.28	85.82	2.13	0.77
292						12.52	84.36	2.07	1.05	11.06	86.04	2.05	0.85
490						11.99	85.00	2.20	0.81				
492						12.04	84.62	2.15	1.19				
293	47	15.44	81.60	2.35	0.61	15.10	81.89	2.16	0.85	14.03	82.93	2.10	0.94
295						14.47	82.63	1.90	1.00	13.65	83.53	1.95	0.87
493						14.85	82.33	2.05	0.77				
495						14.82	82.30	2.05	0.83				
294	48	13.32	83.13	2.86	0.69	12.08	84.60	2.32	1.00	10.21	86.81	2.02	0.96
296						12.07	84.60	2.34	0.99	9.91	87.23	1.98	0.88
494						11.97	84.67	2.33	1.03				
496						11.74	85.01	2.29	0.97				
297	49	15.73	80.29	2.91	1.07	15.24	81.00	2.30	0.96	14.98	81.05	3.01	0.96
299						15.42	80.62	2.93	1.03	14.07	82.20	2.84	0.89
497						14.86	81.55	2.62	0.97				
499						15.48	80.60	2.80	1.12				

Table 13—Continued.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
298	50	13.89	81.06	3.90	1.15	12.79	82.71	3.51	0.99	12.25	83.38	3.40	0.97
300						13.01	82.40	3.74	0.85	11.80	84.04	3.32	0.84
498						13.28	82.17	3.66	0.89				
500						12.82	82.59	3.70	0.89				
300	51	15.74	80.42	2.94	0.90	14.80	81.62	2.61	0.97	14.94	81.28	2.82	0.96
303						14.94	81.57	2.63	0.86	14.99	81.20	2.88	0.93
501						15.33	81.00	2.81	0.86				
503						14.74	81.83	2.38	1.05				
302	52	13.31	84.10	1.85	0.74	12.65	84.76	1.71	0.88	11.97	85.47	1.67	0.89
304						12.85	84.56	1.71	0.88	11.51	86.02	1.58	0.89
502						12.85	84.54	1.58	1.03				
504						13.00	84.57	1.63	0.80				
305	53	15.55	81.61	2.04	0.80	15.34	81.88	2.03	0.75	13.93	83.45	1.71	0.91
307						15.28	82.02	1.74	0.96	14.33	83.02	1.72	0.93
505						15.45	81.63	1.86	1.06				
507						15.25	81.85	1.92	0.98				
306	54	13.22	84.44	1.79	0.55	12.77	84.99	1.60	0.64	11.86	85.90	1.47	0.77
308						13.35	84.24	1.56	0.85	11.86	85.79	1.52	0.83
506						13.12	84.45	1.56	0.87				
508						13.82	83.85	1.58	0.75				
309	55	14.59	82.83	1.77	0.81	13.91	83.52	1.49	0.08	13.39	84.20	1.51	0.90
311						14.96	82.44	1.79	0.81	13.14	84.59	1.41	0.86
509						14.15	83.43	1.57	0.85				
511						14.38	83.37	1.61	0.64				
310	56	13.31	84.36	1.68	0.65	13.40	84.34	1.33	0.93	12.15	85.62	1.36	0.87
312						12.60	85.09	1.52	0.79	13.80	83.41	1.75	0.98
510						13.09	84.60	1.46	0.85				
512						12.52	85.32	1.39	0.77				
313	57	15.74	81.05	2.51	0.70	16.31	80.06	2.46	1.17	13.50	83.47	2.15	0.88
315						15.52	81.15	2.25	1.08	14.22	82.58	2.20	1.00
513						15.37	81.34	2.20	1.09				
515						15.14	81.58	2.26	1.02				
314	58	13.01	84.57	1.93	0.49	12.65	84.96	1.80	0.59	11.54	86.01	1.73	0.72
316						12.60	84.91	1.83	0.66	11.76	85.60	1.76	0.88
514						12.58	85.00	1.68	0.74				
516						12.67	84.84	1.81	0.68				

Table 13—Continued.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
317	59	16.54	79.18	3.50	0.78	15.00	80.88	3.06	1.06	13.23	83.20	2.71	0.81
319						15.43	80.45	3.09	1.03	13.38	83.03	2.75	0.84
517						16.15	79.58	3.24	1.03				
519						16.31	79.52	3.16	1.01				
318	60	13.48	83.70	2.21	0.61	13.01	84.24	1.96	0.79	12.40	84.51	2.11	0.98
320						12.98	84.25	1.99	0.78	12.11	85.19	1.92	0.78
518						13.19	83.95	2.05	0.81				
520						13.29	83.95	2.10	0.66				
321	61	16.06	80.39	2.69	0.86	15.47	80.97	2.46	1.10	14.47	82.22	2.36	0.95
323						15.03	81.61	2.62	0.74	14.09	82.00	2.23	0.88
521						16.44	79.63	2.73	1.20				
523						15.80	80.71	2.68	0.81				
322	62	14.49	82.18	2.68	0.65	13.26	83.61	2.33	0.80	12.39	84.56	2.12	0.93
324						13.74	83.11	2.40	0.75	12.10	85.02	2.05	0.83
522						13.62	83.22	2.47	0.69				
524						14.18	82.66	2.45	0.71				
325	63	15.49	81.83	2.33	0.80	15.07	81.91	2.15	0.87	13.88	83.03	2.14	0.95
327						14.77	82.53	2.06	0.64	12.77	84.57	1.68	0.98
525						15.58	81.27	2.24	0.81				
527						15.11	81.85	2.22	0.82				
326	64	13.39	83.85	2.05	0.71	13.16	84.23	1.73	0.88	11.77	85.62	1.66	0.95
328						13.19	83.99	1.91	0.91	12.00	85.45	1.68	0.87
526						12.96	84.09	1.88	1.07				
528						13.40	83.85	1.93	0.82				
329	65	16.15	80.67	2.27	0.91	15.83	81.14	2.16	1.17	14.94	82.04	2.02	1.00
331						15.48	81.30	2.13	1.09	14.15	82.99	1.80	1.06
529						15.47	81.17	2.08	1.28				
531						15.22	81.30	2.04	1.44				
330	66	14.14	82.23	2.69	0.94	13.13	83.66	2.35	0.86	11.77	85.22	2.09	0.92
332						13.08	83.78	2.24	0.90	11.80	85.36	2.04	0.80
530						13.34	83.56	2.37	0.73				
532						13.09	83.77	2.28	0.86				
333	67	15.15	82.02	1.85	0.98	15.16	82.26	1.65	0.93	13.68	83.84	1.56	0.92
335						14.70	82.77	1.61	0.92	13.34	82.12	1.56	0.98
533						15.35	81.86	1.64	1.15				
535						15.02	82.35	1.53	1.10				
334	68	12.94	84.42	1.88	0.76	13.35	84.16	1.87	0.62	11.58	86.14	1.43	0.85
336						13.15	84.18	1.68	0.99	11.06	86.78	1.41	0.75
534						12.57	84.64	1.76	1.03				
536						12.60	84.94	1.52	0.94				

Table 13—Continued.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
337	69	15.85	81.82	2.19	0.94	15.88	80.63	2.25	1.24	13.40	84.00	1.64	0.96
339						15.33	81.38	2.00	1.29	14.10	83.18	1.77	0.95
537						15.33	81.03	2.09	1.55				
539						14.97	81.74	2.15	1.14				
338	70	13.59	83.59	1.98	0.84	12.90	84.43	1.82	0.83	11.68	85.97	1.57	0.78
340						12.75	84.65	1.74	0.86	11.68	85.94	1.59	0.79
538						12.91	84.49	1.84	0.76				
540						12.92	84.50	1.80	0.78				
341	71	14.94	82.22	1.99	0.85	14.51	82.74	1.63	1.12	13.17	84.39	1.55	0.89
343						15.09	81.81	1.96	1.14	12.51	85.17	1.46	0.86
541						14.60	82.40	1.80	1.20				
543						14.30	82.96	1.65	1.09				
342	72	13.21	84.07	1.91	0.81	13.10	84.21	1.81	0.88	11.30	86.27	1.51	0.82
344						13.06	84.27	1.82	0.85	11.59	85.97	1.56	0.88
542						12.87	84.46	1.78	0.89				
544						12.75	84.69	1.72	0.84				
345	73	14.52	82.67	1.97	0.84	14.67	82.37	1.82	1.14	13.03	84.42	1.77	0.78
347						15.51	81.20	2.18	1.11	13.56	83.84	1.75	0.85
545						15.09	81.55	2.00	1.36				
547						14.77	82.07	2.00	1.16				
346	74	12.80	84.42	1.78	1.00	12.80	84.69	1.62	0.89	11.37	86.37	1.52	0.74
348						12.69	84.81	1.71	0.79	11.33	86.47	1.48	0.72
546						13.17	84.21	1.83	0.79				
548						11.56	85.78	1.65	1.01				
349	75	14.21	81.89	1.12	0.78	14.15	82.01	2.77	1.07	12.10	84.75	2.33	0.82
351						14.27	81.65	3.06	1.02	13.35	82.82	2.96	0.87
549						14.52	81.57	3.02	0.89				
551						14.13	82.14	2.81	0.92				
350	76	13.08	84.58	1.55	0.79	12.62	85.29	1.40	0.69	11.65	86.19	1.32	0.84
352						12.77	85.04	1.44	0.75	11.41	86.43	1.24	0.92
550						12.80	84.94	1.49	0.77				
552						12.83	84.95	1.39	0.83				
353	77	15.15	82.26	1.69	0.90	15.22	82.15	1.54	1.09	12.02	83.64	1.47	0.87
355						14.83	82.67	1.52	0.98	13.36	84.40	1.32	0.92
553						15.30	82.38	1.46	0.86				
555						15.25	81.87	1.80	1.08				
354	78	13.59	83.85	1.77	0.79	13.78	83.61	1.64	0.97	12.16	85.71	1.32	0.81
356						13.96	83.26	1.57	1.21	11.88	85.90	1.41	0.81
554						13.76	83.57	1.79	0.88				
556						13.56	83.84	1.66	0.94				

Table 13—Continued.

Tub No.	Churn No.	Samples taken from churn				Four tubs 24 hours later				After 6 to 7 months in storage			
		Percent				Percent				Percent			
		Water	Fat	Salt	Casein	Water	Fat	Salt	Casein	Water	Fat	Salt	Casein
357	79	14.14	83.46	1.63	0.77	14.46	83.12	1.50	0.92	12.81	85.00	1.31	0.88
359						14.69	82.52	1.63	1.16	12.71	85.04	1.26	0.99
557						14.04	83.34	1.46	1.16				
559						14.19	83.08	1.43	1.30				
358	80	13.19	84.64	1.41	0.76	13.70	84.11	1.36	0.83	12.15	85.81	1.23	0.81
360						13.38	84.38	1.31	0.93	12.07	85.88	1.22	0.83
558						13.35	84.45	1.20	0.91				
560						13.19	84.15	1.39	0.87				
Av.	....	14.32	82.03	2.25	0.90	13.71	83.34	20.80	0.88	12.62	84.55	1.98	0.85

General Summary of Table 13.

High moisture and low fat butter.

Number of samples analyzed	Samples taken from			Difference between	
	Churn	Tub 24 hours later	Tub after storage	Churn and Tub	Tub before and after storage
40....Percent water	15.31				
160		14.69		0.62	
80			13.64		1.05
40....Percent fa	81.25				
160		82.02		0.77	
80			83.24		1.22
40....Percent salt....	2.49				
160		2.31		0.04	
80			2.23		0.08
40....Percent casein	0.95				
160		0.95		0.00	
80			0.89		0.07
Low moisture and high fat butter.					
40....Percent water	13.32				
160		12.74		0.58	
80			11.60		1.14
40....Percent fat	83.81				
160		84.66		0.85	
80			85.86		1.20
40....Percent salt	2.02				
160		1.84		0.18	
80			1.73		0.11
40....Percent casein	0.84				
160		0.81		0.03	
80			0.81		0.00

A preliminary study of the composition of various samples of butter taken from the same churning or tubs of butter, gave a large amount of data which is verified in the above Table.

While analyses of samples taken to represent the same butter will not give like results, yet from previously accumulated data we know that the analysis of one sample properly taken will give the approximate composition of the butter in question. From Table 8, Influence of Pasteurization upon Composition of 1907 Butter, the average results show that the water content of all the samples taken from the 56 churnings is approximately one percent higher than the average of all the samples taken from the tubs before storage. The same degree of difference is found between samples of the butter taken from these same tubs after storage. Does this difference indicate that the variation is due to the method of sampling; to actual loss of water in packing; or a loss of water incident to storage? An average of the tub analyses furnishes a basis for calculating the amount of fat recovered in the butter. This was done for the 56 churnings in 1907. The final average for each churning day was 452.5 pounds of butter fat and of this amount 447.1 pounds were recovered, based on the average of the chemical analysis. The only loss of butter fat was in the buttermilk.

Since butter fat in the cream as determined by the Babcock Test, corresponds so closely to butter fat recovered in the butter, as determined by chemical analysis of tub sample, it is reasonable to conclude that the tub sample quite accurately represents the average composition of the butter.

Table 14. Butter Fat Received, Churned and Recovered in the Butter in 56 Consecutive Churnings.

Date 1907	Lb. cream received	Percent Fat	Butter fat	Pounds in each churning				Lb. but- ter made	Tub No.	Percent fat in each tub	Average percent fat in 2 tubs	Lb. butter fat re- covered
				Cream	Percent fat	Butter fat						
June	3	818	35.5	290.39	500	30.00	150.0	178.0	1	84.59		150.57
					475	30.00	142.5	166.0	2	85.26		141.53
				290.39	292.5				292.10			
June	4	1104	33.0	364.32	620	29.00	179.80	210.0	3	85.17		178.85
					629	29.00	182.41	215.0	4	85.01		182.77
				364.32	362.21				361.62			
June 7, 8	1239	31.05	390.29	385	26.00	100.10	117.0		7	84.98	85.09	99.479
									8	85.07		
					391	26.00	101.66	119.0	11	85.04	85.24	101.435
									12	85.44		
					350	27.00	94.50	113.0	5	84.63	84.36	95.326
									6	84.09		
				350	27.00	94.50	113.0	9	83.75	84.09	95.021	
								10	84.43			
				390.29	390.76				391.26			
June 11, 12	1586	32.0	507.52	464	27.00	125.28	147.5		15	84.30	83.77	123.56
									16	83.24		
					506	27.00	136.62	154	19	84.85	85.16	131.146
									20	85.47		
					464	27.00	125.28	148.0	13	82.73	82.435	122.003
									14	82.14		
					464	27.00	125.28	141.0	17	85.09	84.695	119.419
									18	84.30		
				507.52	512.46				496.128			
June 14, 15	1566	31.5	493.29	461	26.00	119.86	139.0		23	83.39	83.235	115.696
									24	83.08		
					513	26.00	133.38	150.0	27	84.38	84.63	126.945
									28	84.88		
					461	26.00	119.86	140.0	21	83.67	83.54	116.956
									22	83.41		
					451	26.00	117.26	138.0	25	82.27	82.205	113.442
									26	82.14		
				493.29	490.36				473.039			

Table 14—Continued.

Date 1907	Lb. cream received	Percent fat	Pounds in each churning					Tub No.	Percent fat in each tub	Average percent fat in 2 tubs	Lb. butter fat re- covered
			Butter fat	Cream	Percent fat	Butter fat	Lb. but- ter made				
June 18, 19	2210	32.5	718.25	620	28.00	173.60	211.0	31	84.35	84.445	178.176
								32	84.54		
				674	28.00	188.72	226.0	35	84.16	83.885	189.58
								36	83.61		
				620	28.00	173.60	209.0	29	84.15	84.11	175.789
								30	84.07		
				648	28.00	181.44	224.0	33	81.96	82.07	183.836
								34	82.18		
				718.25		717.36					727.383
June 21, 22	1688	34.0	575.92	516	26.0	134.16	156.0	39	83.47	83.83	130.774
								40	80.19		
				499	26.0	129.74	153.0	43	84.63	84.765	129.690
								44	84.90		
				516	26.5	136.74	162.0	37	82.79	83.245	134.856
								38	83.70		
				503	26.5	133.295	159.0	41	83.19	83.465	132.709
								42	83.74		
				573.92		533.935					528.029
June 24	651	29.0	188.79	499	20.0	99.80	121.0	47	83.14	83.08	100.526
								48	83.02		
				452	20.0	99.40	104.0	45	83.95	84.005	87.365
								46	84.06		
				188.79		190.20					187.891
June 25, 26	1503	35.0	526.05	431	29.0	124.99	146.5	51	84.32	84.06	123.147
								52	83.80		
				521	29.0	151.09	179.0	55	84.65	84.645	151.514
								56	84.64		
				431	29.0	124.99	149.0	49	83.31	83.245	124.035
								50	83.18		
				430	29.0	124.70	147.0	53	84.23	84.44	124.126
								54	84.65		
				526.05		525.77					522.822
June 28, 29	1440	24.0	489.60	430	28.0	120.40	144	59	83.77	83.79	120.657
								60	83.81		
				479	28.0	134.12	162	63	83.81	84.10	136.242
								64	84.39		
				430	28.0	120.40	144	57	82.50	82.395	118.648
								58	82.29		
				425	28.0	119.00	144	61	82.34	82.545	118.864
								62	82.75		
				489.60		493.92					494.11

Table 14—Continued.

Date 1907	Lb. cream received	Percent fat	Butter fat	Pounds in each churning			Lb. butter made	Tub No.	Percent fat in each tub	Average percent fat in 2 tubs	Lb. but- ter fat re- covered
				Cream	Percent fat	Butter fat					
July 1	438	37.0	162.06	370	22.0	81.40	92	67	83.58	83.985	77.266
								68	84.39		
				364	22.0	80.08	92	65	79.95	79.755	73.374
								66	79.56		
			162.06			161.48					150.640
July 2	1436	34.5	495.42	428	29.0	124.12	148	71	83.78	83.735	123.921
								72	83.69		
				428	29.0	124.12	149	75	83.13	83.455	124.347
								76	83.78		
				428	29.0	124.12	149	69	81.88	81.860	121.971
								70	81.84		
				436	29.0	126.440	151	73	83.66	83.550	126.160
								74	83.44		
			495.42			498.80					496.405
July 5	1480	33.0	488.40	436	27.5	119.90	141	79	82.97	83.12	117.199
								80	83.27		
				444	27.5	122.10	145	83	84.28	84.30	122.230
								84	84.32		
				436	27.5	119.90	139	77	80.86	80.77	112.270
								78	80.68		
				454	27.5	124.85	151	81	81.47	81.485	123.042
								82	81.50		
			488.40			486.75					474.741
July 9, 10	1940	34.0	659.60	600	27.5	165.50	195	87	81.88	82.38	160.641
								88	82.88		
				606	27.5	166.65	196	91	83.85	84.105	164.845
								92	84.36		
				600	27.5	165.50	197	85	83.80	83.585	164.662
								86	83.37		
				600	27.5	165.50	198	89	82.30	82.51	163.369
								90	82.72		
			659.60			663.15					653.517
July 12, 13	1798	29.0	521.42	515	26.0	133.90	156	95	84.31	84.26	131.445
								96	84.21		
				512	26.0	133.12	159	99	84.02	83.93	133.448
								100	83.84		
				515	26.0	133.90	162	93	81.64	81.715	132.378
								94	81.79		
				496	26.0	128.96	155	97	85.02	84.95	131.672
								98	84.88		
			521.42			529.88					528.943

Table 14—Continued.

Date 1907	Lb. cream received	Percent fat	Butter fat	Pounds in each churning				Tub No.	Percent fat in each tub	Average percent fat in 2 tubs	Lb. butter fat re- covered
				Cream	Percent fat	Butter fat	Lb. butter made				
July	1069	36.5	390.185	418	24.0	100.32	118.5	103	83.12	83.170	98.556
15, 16								104	83.22		
				405	24.0	97.20	112.0	107	84.03	83.875	93.940
								108	83.72		
				418	23.5	98.23	116.5	101	83.70	83.775	97.597
								102	83.85		
				408	23.5	95.88	114.0	105	82.66	82.81	94.403
								106	82.96		
			390.185			391.63					384.496
Total amount handled	....	7259.50			7241.16	8565.0					7154.43
Aver. per day	..	453.71			452.57	535.3					447.15

Comparison of Butter Fat Churned and Recovered in the Butter.

The results obtained from these comparisons gave such interesting data in the 1907 experiments that it seemed best to collect additional data of a similar nature. The 1908 experiment offered an excellent opportunity for this work since it was conducted on a much larger scale, thus reducing the percent of mechanical error and giving more uniform results.

To obtain an accurate determination of the butter fat handled in each of the twenty comparisons, each delivery of milk and cream was tested, involving a fat determination of 1494 individual samples. The cream thus obtained for each churning day was placed in two ripeners, a sample from which was tested in triplicate, from each vat before and after the starter was added. The cream in the ripeners was churned in four churnings from which sixteen representative tubs were packed.

Samples were taken for analysis from the churn and by trier from the tubs twenty-four hours later. The percent of fat found in these samples was in turn compared with the Babcock determination of fat delivered on that respective day.

As an illustration, May 6, the amount of butter fat churned according to each patron's test, was 819 pounds; the test of cream in the two ripeners before starter was added gave 809.4 pounds and the test after starter was added gave 807.8 pounds. All of this cream was churned in churnings Nos. 1 to 4. The churns contained 297, 192, 297 and 195 pounds of butter respectively, or a total of 981 pounds. Referring to Table 13, it can be seen that the sample from churn 1 contained 80.81 per cent of fat, and the average per cent of fat in the four tubs of butter was 83.24. The same method of determination was used in the other three churnings. The total pounds of butter fat recovered for the day was, according to samples taken from churns, 809.06 and from tubs 826.35. The same system of checking was followed for each succeeding day

Table 15. Butter Fat Churned and Recovered in the Butter in 80 Consecutive Churnings.

Date 1908	Butter fat churned according to test			Churn No.	Pounds butter made	Butter fat recovered in butter according to samples taken from			
	Each Patron's delivery	Before starter was added	After starter was added			Churn		Four tubs	
						Percent fat in butter	Pounds fat in butter	Percent fat in butter	Pounds fat in butter
May 6	819	402.6	243.0	1	297	80.81	240.00	83.24	247.22
		406.8	159.0	2	192	83.17	159.68	84.33	161.91
			243.0	3	297	82.66	245.50	84.29	250.34
			162.8	4	195	84.04	163.88	85.58	166.88
	819	809.4	807.8		981	82.52	809.06	84.23	826.35
May 9	962	466.6	291.5	5	348	81.03	281.98	82.58	287.38
		469.6	177.5	6	214	83.66	179.03	84.73	181.32
			297.0	7	354	82.12	290.70	83.02	293.89
			176.8	8	210	82.62	173.50	84.69	177.85
	962	936.2	942.8		1126	82.17	925.21	82.18	958.45
May 13	953	482.0	319.0	9	382	80.51	307.54	82.13	313.73
		474.8	167.6	10	197	84.15	165.77	85.01	167.47
			313.5	11	382	80.42	307.20	81.16	310.03
			165.3	12	199.5	82.24	164.07	83.82	167.22
	953	956.8	965.4		1160.5	81.39	944.58	82.28	958.45
May 15	894.5	446.0	297.0	13	360	80.06	288.21	81.43	293.15
		444.5	151.5	14	178	83.82	149.20	85.26	151.76
			297.0	15	356.5	80.33	286.37	82.12	292.75
			150.0	16	178	83.61	148.82	85.02	151.33
	894.5	890.5	895.5		1072.5	81.36	872.60	82.88	888.99
May 19	945.2	477.8	308	17	376	80.42	302.38	81.93	308.05
		472.8	167.4	18	193	84.60	163.28	85.85	165.69
			308	19	375.5	80.63	302.76	82.23	308.88
			664.4	20	190	84.02	159.63	85.33	162.12
	945.2	950.6	947.7		1134.5	81.82	928.05	83.26	944.63
May 22	957.5	953.7	313.5	21	386	81.15	313.24	82.84	319.76
			161.3	22	197.5	84.46	166.80	85.72	169.29
			313.5	23	390	92.12	320.26	83.50	325.65
			169.8	24	205	84.22	172.65	85.50	175.27
	957.5	953.7	958.1		1178.5	82.56	972.95	84.00	989.95
May 26	1045.5	1059.34	346	25	424	81.25	344.50	81.47	345.43
			185.5	26	223	84.25	187.88	85.00	189.55
			346.5	27	420	80.75	339.15	82.91	348.22
			180.8	28	215	82.91	178.25	84.01	180.62
	1045.5	1059.34	1059.3		1282	81.88	1049.78	82.99	1063.82

Table 15—Continued.

Date 1908	Butter fat churned according to test			Churn No.	Pounds butter made	Butter fat recovered in butter according to samples taken from			
	Each Patron's delivery	Before starter was added	After starter was added			Churn		Four tubs	
						Percent fat in butter	Pounds fat in butter	Percent fat in butter	Pounds fat in butter
May 29..	879.7	892.49	297.0	29	358	80.68	288.83	81.98	293.49
			153.9	30	178	84.65	150.67	84.98	151.25
			297.0	31	358	82.52	295.42	84.16	294.13
			143.9	32	167	84.34	140.84	84.67	141.40
			879.7		1061	82.54	875.76	82.97	880.27
June 2 ...	1056	1031.68	352	33	432.5	81.38	351.97	81.59	352.88
			164.8	34	196.0	85.52	167.62	85.68	167.93
			352	35	426.0	82.31	350.64	82.80	352.73
			162.88	36	192.5	84.18	162.04	84.92	163.47
			1056		1247	82.78	1032.27	83.16	1037.01
June 5	1062.7	1063.04	352	37	433	80.06	346.66	81.07	351.03
			176.32	38	210.5	84.18	177.20	85.13	179.20
			352	39	421	81.98	345.13	83.40	351.11
			182.72	40	214	83.25	178.15	84.83	181.54
			1062.7		1278.5	81.90	1047.14	83.13	1062.88
May 9	1161.6	1145.62	357.5	41	453	79.59	360.54	80.40	364.21
			214.17	42	255.5	84.57	216.07	85.34	218.04
			357.50	43	438	81.60	357.40	81.72	357.93
			216.45	44	265.5	83.58	221.90	84.19	223.52
			1161.6		1412	81.86	1155.91	82.41	1163.70
May 12	1128.58	1088.64	325	45	428	80.89	346.21	81.88	350.45
			198.72	46	237	83.11	196.97	84.66	200.45
			352	47	432.5	81.60	352.92	82.29	355.90
			185.6	48	221.5	83.13	184.13	84.72	187.65
			1128.58		1319	81.9	1080.23	82.99	1094.64
June 16....	915.4	908.82	302.5	49	375	80.92	301.08	80.94	303.52
			153.17	50	190	81.06	154.01	82.47	156.69
			302.5	51	371	80.42	298.35	81.51	302.40
			148.22	52	173.5	84.10	145.91	84.61	146.80
			915.4		1109.5	81.06	899.35	81.96	909.41
June 18	696.1	692.54	220.5	53	265	81.61	216.26	81.85	216.90
			123.23	54	145	84.44	122.43	84.38	122.35
			220.5	55	266	82.83	220.32	83.19	221.28
			121.27	56	143	84.36	120.63	84.84	121.32
			696.1		819	82.98	679.64	83.25	681.85



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Table 15—Continued.

Date 1908	Butter fat churned according to test				Churn No.	Pounds butter made	Butter fat recovered in butter according to samples taken from			
	Each Patron's delivery	Before starter was added	After starter was added				Churn		Four tubs	
							Percent fat in butter	Pounds fat in butter	Percent fat in butter	Pounds fat in butter
June 19....	909.2	900.93	291.50	57	351	81.05	284.48	81.03	284.41	
			163.24	58	191	84.57	161.52	84.93	162.21	
			291.50	59	357	79.18	282.67	80.11	285.99	
			152.11	60	179	83.70	149.82	84.09	150.52	
	909.2	900.93	898.35		1078	81.49	878.49	81.92	883.13	
June 23....	901.6	900.24	291.5	61	355	80.39	285.38	80.73	286.59	
			163.24	62	195	82.18	160.25	83.15	162.14	
			291.5	63	341	81.38	277.50	81.89	279.24	
			150.52	64	178	83.85	149.25	84.04	149.59	
	901.6	900.24	896.76		1069	81.59	872.38	82.09	877.56	
June 25....	688.3	670.72	204	65	254.5	80.67	205.30	81.23	206.73	
			147.39	66	175.5	82.23	144.31	83.69	146.87	
			175	67	224	82.02	183.72	82.31	184.87	
			133.5	68	159	84.42	134.44	84.48	134.32	
	688.3	670.72	659.89		813	82.17	667.55	82.69	672.29	
June 26....	763.26	751.50	245	69	294	81.02	238.19	81.19	238.70	
			132.54	70	157	83.59	131.23	84.52	132.69	
			245	71	289	82.22	237.60	82.48	238.36	
			131.32	72	155	84.07	130.3	83.31	130.83	
	763.26	751.50	753.86		895	82.39	737.3	82.74	740.58	
June 30.....	662.16	662.16	206.25	73	244	82.67	201.71	81.79	199.57	
			123.75	74	144	84.42	121.56	84.87	122.21	
			206.25	75	246	81.	201.45	81.84	201.32	
			123.75	76	144	84.58	121.79	85.06	122.48	
	662.16	660.00			778	83.10	646.51	82.98	645.58	
June 30	598.81	598.81	168.0	77	199	82.26	163.69	82.27	163.72	
			128.4	78	156	83.85	130.80	85.57	130.37	
			171.5	79	202	83.46	168.59	83.02	167.70	
			128.13	80	152	84.64	128.65	84.27	128.09	
	1256.4	598.81	596.03		709	83.46	591.73	83.20	589.88	
Gen. av each day	899.79	893.30	892.71		1076.15	82.90	883.43	82.94	892.57	

The summary of Table 15 shows a remarkable coincidence between butter fat delivered, butter fat churned, and butter fat recovered in the butter. The average amount of butter fat received each day was, according to the patron's test, 899.79 pounds; test before starter was added 893.2 pounds and test after starter was added 892.71 pounds. The average butter fat recovered was, according to churn samples 883.43 and tub sample 892.57 pounds. The data are so arranged that each day's comparison is complete in itself, except that on June 30, the 1,256.4 pounds of butter fat were divided into two comparisons. The total butter made in this experiment was 21,523 pounds. An average for each day of 1,076.15 pounds. The average per cent butter fat in churn and tub samples were 82.09 and 82.94 respectively. Difference 0.83 per cent.

Table 16. Overrun Obtained in Eighty Consecutive Churnings.

According to				According to			
Churn No.	Butter fat churned	Percent of fat in sample taken from		Churn No.	Butter fat churned	Percent of fat in samples taken from	
		Churn	Four tubs			Churn	Four tubs
1.....	22.2	23.7	20.1	41....	26.7	25.6	24.3
2.....	20.7	20.2	18.6	42....	19.3	18.2	17.2
3.....	22.2	21.0	18.6	43....	22.5	22.5	22.4
4.....	20.4	19.0	16.8	44....	22.6	19.6	18.8
5.....	19.4	23.4	21.1	45....	21.5	23.6	22.1
6.....	20.5	19.5	18.0	46....	19.2	20.3	18.1
7.....	19.2	21.8	20.5	47....	22.8	22.5	21.5
8.....	18.7	21.0	18.0	48....	19.3	20.3	18.0
9.....	19.7	24.2	21.7	49....	24.0	24.5	23.5
10.....	17.5	18.8	17.6	50....	24.0	23.3	21.2
11.....	21.8	24.3	23.2	51....	22.6	24.3	22.6
12.....	20.6	21.6	19.3	52....	17.0	18.9	18.2
13.....	21.2	24.9	22.8	53....	20.1	22.5	22.2
14.....	17.5	19.3	17.3	54....	17.7	18.4	18.5
15.....	20.0	24.5	21.8	55....	20.6	20.7	20.0
16.....	18.6	19.6	17.6	56....	17.8	18.5	17.8
17.....	22.1	24.3	22.0	57....	20.4	23.3	23.4
18.....	15.3	18.2	16.5	58....	17.0	18.2	17.7
19.....	21.9	24.0	21.6	59....	22.4	26.2	24.8
20.....	15.5	19.0	17.2	60....	17.7	19.5	18.9
21.....	23.1	23.2	20.7	61....	21.7	24.4	23.8
22.....	22.4	18.4	16.6	62....	19.5	21.6	20.2
23.....	24.4	21.8	19.7	63....	16.9	22.8	21.1
24.....	20.7	18.7	16.9	64....	18.2	19.2	18.9
25.....	22.3	23.1	22.7	65....	24.7	23.9	23.1
26.....	20.2	18.7	17.6	66....	19.1	21.6	19.5
27.....	21.2	23.8	20.6	67....	19.4	21.9	21.5
28.....	18.9	20.6	19.0	68....	19.1	18.5	18.4
29.....	20.0	23.9	22.0	69....	20.0	23.4	23.1
30.....	15.6	18.1	17.7	70....	18.5	19.6	18.3
31.....	20.5	21.2	21.7	71....	18.0	21.6	21.2
32.....	16.0	18.5	18.1	72....	18.0	18.9	18.5
33.....	22.8	22.8	22.5	73....	18.3	20.9	22.2
34.....	18.9	16.9	16.7	74....	16.4	18.4	17.8
35.....	21.0	21.5	20.7	75....	19.3	22.1	22.1
36.....	18.1	18.7	17.7	76....	16.4	18.2	17.5
37.....	23.0	24.9	23.3	77....	18.5	21.5	21.5
38.....	19.4	18.8	17.5	78....	21.5	19.2	19.6
39.....	19.6	20.9	19.9	79....	17.7	19.8	20.5
40.....	17.1	20.1	17.8	80....	18.8	18.1	18.7
Average					20.5	21.8	20.5

The above Table offers a striking comparison of the over-run obtained. The average over-run when based upon butter fat churned was 20.5 per cent. The highest over-run for a single churning, No. 41, was 26.7 per cent and lowest, in churning 20, which was 15.3 per cent. In these same two churnings the composition in the butter packed in the tubs permitted an over-run of 24.3 and 17.2 per cent respectively. The Table shows remarkable uniformity between butter fat churned and butter fat recovered. The only mechanical loss considered for each individual churning was the butter fat lost in the buttermilk. If the creamery operators are to use the over-run recorded in the above Table as standard, they must take the following facts into consideration:

1. The loss in handling the milk and cream until it reaches the churn, must be reduced to a minimum.
2. The weight of butter packed must be the same as weight on bill of sale.
3. The butter fat paid for must be approximately the actual amount received.
4. After allowing for the mechanical loss, the over-run should be consistent with the per cent of fat actually in the butter. By referring to Table 15, May 26, the butter in the tubs from churning 25 contained 81.47 per cent fat and churning 26 from the same vat of cream contained 85.00 per cent of fat or a difference in fat content of 3.53 per cent.

The greatest factor influencing over-run obtained in creamery operation, is the sampling and testing of the milk and cream received. An error of one-tenth of one per cent in testing 4.0 per cent milk and one per cent in 40 per cent cream will alter the over-run 3 per cent.

Table 17 is made up from Tables 15 and 16, in order to give a complete daily comparison of the butter fat received and churned, total pounds of butter made, together with the respective over-run.

The final average over-run is the same when based upon butter fat churned and butter fat recovered, according to the per cent of fat in samples taken from 320 tubs of butter representing 80 churnings. The over-run calculated from the per cent of fat in the samples taken from the 80 churnings is 1.3 per cent higher. This difference indicates that, either the reading of the Babcock bottle was high or the churn sample gave a per cent of fat lower than is actually in the butter. It is safe to assume that in packing the butter into tubs a small amount of water is forced out which would cause a higher fat content in tub samples. The last column in this Table indicates the per cent of over-run based upon butter fat churned after deducting the butter fat lost in the buttermilk. The actual over-run then is one-half of one per cent higher than is possible according to butter fat analyses. Considering the large number of samples of cream tested and butter analyzed the results thus obtained are remarkably consistent.

Table 17. Amount of Butter Fat Churned; Butter Made; Overrun Obtained and Possible Overrun According to Analysis of Churn Samples and Average Analysis of Samples from Sixteen Tubs for Each Day.

Date 1908	Butter (fat churned according to				Percent of overrun according to				
	Individual test	Test before starter was added	Test after starter was added	Churn No.	Pounds butter made	Test after starter was added	Percent fat in churn sample	Percent fat in tub sample	Percent mechanical loss in the buttermilk deducted
May 6	819.0	809.4	807.4	1-4	981.0	21.5	21.2	18.7	44
May 9	962.0	936.3	942.8	5-8	1126.0	18.4	21.7	19.7	69
May 13	953.0	956.8	965.4	9-12	1160.5	20.2	22.8	21.0	40
May 15	894.8	890.5	895.5	13-16	1072.5	19.7	22.9	20.6	38
May 19	945.2	950.6	947.7	17-20	1134.5	19.6	22.8	20.1	37
May 22	957.5	953.7	958.1	21-24	1178.5	23.0	21.1	19.0	37
May 26	1045.5	1059.34	1059.3	25-28	1282.0	21.0	22.1	20.5	38
May 29	879.7	892.49	891.8	29-32	1061.0	18.9	21.1	20.5	38
June 2	1056.0	1031.68	1031.68	33-36	1247.0	20.8	20.8	20.2	18
June 5	1062.7	1063.04	1063.04	37-40	1278.5	20.3	22.1	20.3	25
June 9	1161.6	1145.62	1145.60	41-44	1412.0	23.2	22.1	21.3	43
June 12	1128.58	1088.64	1088.32	45-48	1319.0	21.2	22.1	20.5	41
June 16	915.4	908.82	906.39	49-52	1109.5	22.4	23.3	22.0	47
June 18	696.1	692.54	685.50	53-56	819.0	19.4	20.5	20.1	39
June 19	909.2	900.93	898.35	57-60	1078.0	20.0	22.7	22.0	54
June 23	901.6	900.24	896.76	61-64	1069.0	19.2	22.5	21.8	58
June 25	688.3	670.72	659.89	65-68	813.0	20.9	21.8	20.9	55
June 26	763.26	751.50	753.86	69-72	895.0	18.7	21.3	20.8	54
June 30	1256.4	622.16	660.00	73-76	778.0	17.5	20.3	20.5	24
		598.81	596.03	77-80	709.0	18.9	19.8	20.2	33
Total	17995.84	17863.83	17853.84		21523.0				
Average						20.5	21.8	20.5	41

**Table 18. Composition of Butter When Samples Are Taken From Churn;
From Five Tubs 24 Hours Later and From One of These Tubs Melted.**

Churn No.	Churn sample			Average 5 tubs			Melted tubs		
	Percent			Percent			Percent		
	Water	Fat	Salt	Water	Fat	Salt	Water	Fat	Salt
41	16.64	79.59	2.72	15.99	80.56	2.65	16.48	79.95	2.90
42	12.69	84.57	2.05	12.05	85.37	2.01	11.95	85.35	2.07
43	15.37	81.60	2.07	15.45	81.78	2.26	15.62	81.28	2.36
44	13.59	83.58	1.81	13.04	84.34	1.85	12.52	84.29	1.89
45	15.66	80.89	2.82	14.68	82.00	2.53	15.49	80.85	2.82
46	13.50	83.11	2.75	12.26	84.74	2.19	12.70	84.07	2.49
47	15.44	81.60	2.35	14.73	82.36	2.04	15.18	81.78	2.34
48	13.32	83.13	2.86	11.95	84.76	2.31	12.49	84.01	2.57
49	15.73	80.29	2.91	15.70	81.04	2.74	15.42	80.71	3.07
50	13.89	81.06	3.90	13.01	82.45	3.58	13.21	82.26	3.69
51	15.74	80.42	2.94	14.98	81.44	2.60	15.66	80.50	3.00
52	13.31	84.10	1.85	12.83	84.37	1.68	13.21	84.22	1.90
Average of all comparisons.									
	14.86	81.99	2.50	13.84	82.95	2.37	14.20	82.44	2.59
Average of the six churnings of high water and low fat butter.									
	15.76	80.73	2.63	15.25	81.53	2.46	15.64	80.84	2.39
Average of the six churnings low water and high fat butter.									
	13.36	83.60	2.37	12.52	84.34	2.27	12.77	84.03	2.21

Table 19. Composition of Butter when Samples are Taken by Means of a Trier from Tub 24 Hours after it was Packed; from Same Tub, Frozen, after Six to Seven Months in Storage and from Same Tub Melted.

Tub No.	Tubs 24 hours after packing			Frozen storage			Melted tub		
	Percent			Percent			Percent		
	Water	Fat	Salt	Water	Fat	Salt	Water	Fat	Salt
281	15.28	81.38	2.36	14.33	82.49	2.45	14.18	82.54	2.85
282	11.86	85.56	1.95	10.57	86.97	1.79	10.88	86.63	1.64
285	15.85	81.10	2.36	14.60	82.38	2.14	14.64	82.52	2.17
286	12.96	84.51	1.84	13.32	83.86	2.02	12.36	85.07	1.75
291	15.10	81.52	2.59	14.40	82.20	2.56	14.56	81.99	2.70
290	12.65	84.66	2.26	11.28	85.82	2.13	11.54	85.47	2.28
295	14.47	82.63	1.90	13.65	83.53	1.95	14.32	82.58	2.27
296	13.32	83.13	2.86	9.91	87.23	1.98	10.60	86.36	2.18
299	15.42	80.62	2.93	14.07	82.20	2.84	14.72	81.71	2.88
298	12.79	82.71	3.51	12.25	83.38	3.40	11.95	83.76	3.41
301	14.80	81.62	2.61	14.94	81.28	2.82	14.76	81.26	2.83
302	12.65	84.76	1.71	11.97	85.47	1.67	12.29	85.07	1.74
Average for all comparisons.									
	13.93	82.87	2.40	12.94	83.90	2.31	13.07	83.74	2.37
Average of the six churnings of high water and low fat.									
	15.10	81.48	2.46	14.33	82.34	2.46	14.53	82.10	2.57
Average of the six churnings of low water and high fat.									
	12.70	84.22	2.35	11.55	85.45	2.16	11.00	85.39	2.17

Tables 18 and 19 show why samples of butter taken for analysis do not always agree, even when representing the same churning of butter.

From the 80 churnings recorded in Table 12, one extra tub was packed from each churning numbered 41 to 52. The analyses under churn samples, Table 18, are the same as recorded in Table 13 for these same churnings. The analyses recorded under the average five tubs, are the average of the analyses recorded in Table 13 for the four tubs from each churning, together with the extra tub that was packed from each of the 12 churnings. This extra 30 pounds was melted by placing the butter in a milk can, tightly covered. The results obtained by analyzing the sample taken from melted butter show actual composition of that quantity of butter. The average water content of the 12 tubs melted butter was in this case 0.36 of one per cent higher than that of the average of the trier samples taken from 60 tubs, and 0.36 of one per cent lower than the average of the 12 samples taken from the 12 churns.

In Table 19 there is more of a uniformity between trier and melted sample due to frozen condition of butter when the samples were taken. These tubs are the same recorded in preceding tables and used in the regular experimental work. They belong to churnings 41 to 52. When all the tubs were brought out of the storage room in Chicago they were sampled while the butter was still frozen and the result of analyzing the 160 samples is recorded in Table 13. The 12 tubs to be melted were shipped to Urbana and the samples obtained from the melted tubs in the same manner as for Table 18. The average of the samples taken from the 12 melted tubs was 0.13 of a per cent higher than the trier samples. Trier samples taken after storage contained an average of 0.99 of a per cent less water than the average of the samples taken from the same tubs before storage. This decrease in water content during storage is nearly the same as the average decrease of the 106 tubs which was 1.09 of one per cent.

Table 20. Effect of Composition Upon Quality, Based on the Scores by Five Different Judges.

Pasteurized Butter.											
High moisture and low fat.							Low moisture and high fat				
Judges	No.	1	2	3	4	5	1	2	3	4	5
Churn	Tub										
No.	No.										
1	201....	93.	94.	92.75	93.5	92.5					
	203....	93.	92.	91.5	93.	93.					
2	202....						93.	93.	92.5	93.5	93.
	204....						93.	92.5	92.5	93.5	93.
5	209....	93.	94.	92.	93.5	93.					
	211....	93.	93.	91.7	93.5	92.					
6	210....						92.	93.	91.	93.	93.
	212....						93.	93.	92.75	93	93.
9	217....	92.	90.5	92.75	92.	90.5					
	219....	91.	90.5	92.5	92.5	90.5					
10	218....						91.5	91.5	92.25	92.	92.5
	220....						91.5	90.	92.5	90.	90.5
13	225....	92.5	91.5	91.5	92.	91.5					
	227....	91.5	91.	92.9	92.5	92.					
14	226....						93.	92.	92.75	92.5	92.
	228						92.5	90.5	92.	93.	92.
17	233....	93.	93.	92.	92.	92.					
	235....	92.	92.	92.	93.5	93.					
18	234....						93.	92.	92.	92.	92.
	236....						92.	91.	92.75	93.5	90.5
21	241....	93.	93.5	92.5	93.5	92.					
	243....	93.	93.	92.	93.5	92.5					
22	242....						93.	91.	92.	93.	92.5
	244						93.	93.5	92.	93.5	92.5
25	249....	93.5	92.	91.	93.	92.5					
	251....	93.	93.	93.	92.5	93.					
26	250....						93.	93.5	92.	93.5	92.
	252....						93.	91.5	93.	93.	92.5
29	257....	93.	92.5	92.5	93.	92.					
	259....	93.	93.	92.5	92.	91.5					
30	258....						93.5	90.5	92.5	93.	90.5
	260						93.	93.	92.	93.	92.
33	265....	92.	93.	91.	92.	92.5					
	267....	92.5	92.5	90.5	92.	92.5					
34	266....						91.5	91.5	92.25	92.5	92.5
	268....						92.5	92.	92.75	93.	92.5

Table 20—Continued.

Pasteurized Butter.											
Judges	High moisture and low fat.					Low moisture and high fat					
	No.	1	2	3	4	5	1	2	3	4	
Churn	Tub										
No.	No.										
37	273....	93.	92.5	91.75	93.	92.5					
	275....	92.5	90.	91.75	93.	92.					
38	274....						93.	93.	92.5	93.5	92.5
	276....						93.	92.	92.5	92.	92.5
41	281....	93.	92.5	91.5	92.	93.					
	283....	92.5	92.5	91.	93.	92.					
43	282....						93.	91.5	92.	92.	92.5
	284....						93.	92.	92.	92.5	93.
45	289....	93.	91.	91.	90.	92.5					
	291....	93.	90.5	92.5	93.	92.5					
46	290....						93.	90.5	92.	93.	92.
	292....						93.	91.5	92.	93.	92.5
49	297....	93.	91.5	92.	92.	92.5					
	299....	92.5	93.	91.5	93.	92.					
50	298....						92.5	92.	92.	92.	92.
	300....						93.	92.	91.	89.	92.5
53	305....	93.5	90.5	93.	86.	93.					
	307....	93.	90.5	93.	90.	93.					
54	306....						93.	91.5	92.5	92.	93.
	308....						93.	92.5	92.5	90.	92.5
57	313....	93.	92.	93.	93.	92.5					
	315....	93.	92.5	93.	93.	92.5					
58	314....						93.5	93.	92.5	93.	92.
	316....						93.	92.5	92.25	92.	92.5
61	321....	93.	93.	91.75	92.	92.5					
	323....	92.5	92.	92.	92.	92.					
62	322....						93.	91.5	92.5	93.	92.5
	324....						93.	93.	91.	87.	92.5
65	329....	91.	88.	90.5	87.	90.5					
	331....	91.	86.	91.	87.	90.5					
66	330....						91.5	86.	91.	86.	90.
	332....						92.	85.5	91.5	86.	90.
69	337....	93.	93.	92.7	92.	92.5					
	339....	93.5	92.5	92.5	93.	92.					
70	338....						93.	93.	92.75	93.	92.5
	340....						92.5	93.	91.75	93.	92.5

Table 20—Continued.

Pasteurized Butter.											
High moisture and low fat.							Low moisture and high fat				
Judges	No.	1	2	3	4	5	1	2	3	4	5
Churn	Tub										
No.	No.										
73	345....	93.	93.	92.	93.	93.					
	347....	93.	93.	92.5	93.	92.					
74	346....						93.	91.5	92.25	92.	93.
	348....						93.	91.	92.5	93.	92.
77	353....	93.	91.5	92.	92.5	92.5					
	355....	93.	89.5	92.	92.5	92.					
78	354....						91.	92.5	93.	93.	93.
	356....						91.	92.5	92.	92.5	92.
Average.....		92.7	91.86	91.98	92.11	92.20	92.67	91.71	92.18	92.07	92.2
Unpasteurized Butter.											
3	205....	93.	94.	93.	94.	93.5					
	207....	93.	93.	91.	93.	93.5					
4	206....						93.	93.	92.25	92.	93.
	208....						92.5	91.5	92.75	93.	92.5
7	213....	93.	90.	91.	93.	92.					
	215....	92.5	92.	91.	92.	92.5					
8	214....						93.	91.	91.	93.5	92.
	216....						92.	93.	92.	93.5	92.
11	221....	92.	92.	90.	93.5	92.					
	223....	92.	92.5	92.	92.	91.					
12	222....						92.5	93.	91.	93.5	93.
	224....						92.5	91.5	93.	93.	92.
15	229....	93.	93.	91.5	93.	92.					
	231....	93.5	90.5	90.5	93.	90.5					
16	230....						93.	92.	91.5	93.	92.
	232....						92.5	93.5	91.	93.5	92.5
19	237....	93.	93.	92.5	93.	92.5					
	239....	93.	92.	91.5	92.	92.					
20	238....						93.5	93.	92.	93.	92.5
	240....						93.	92.	92.5	93.5	92.5
23	245....	93.	93.5	92.5	93.	93.5					
	247....	93.	94.	93.	94.	93.5					
24	246....						92.5	90.	92.	90.	92.5
	248....						93.	92.5	92.5	92.	93.
27	253....	93.	93.5	92.5	93.	93.					
	255....	93.	93.	92.5	92.	93.					

Table 20—Continued.

Unpasteurized Butter.

High moisture and low fat.							Low moisture and high fat				
Judges	No.	1	2	3	4	5	1	2	3	4	5
Churn	Tub										
No.	No.										
28	254....						93.	93.	91.5	93.	92.5
	256....						93.	92.5	92.5	93.5	92.
31	261....	93.	93.	92.5	90.	92.					
	263....	92.5	93.5	91.75	93.	93.					
32	262....						93.	93.	91.5	93.	92.
	264....						93.	92.	92.	90.	92.
35	269....	92.	93.	91.	88.	92.					
	271....	92.	93.	92.25	93.	92.5					
36	270....						93.	92.	92.75	92.	92.
	272....						93.	93.	91.75	93.	92.5
39	277....	92.5	91.5	92.	93.5	92.5					
	279....	93.	93.	91.	92.	93.					
40	278....						93.	93.5	92.75	93.	93.
	280....						93.	93.	92.75	93.	93.
43	285....	92.5	93.	91.5	87.	92.					
	287....	92.5	92.	92.	92.	92.5					
44	286....						93.	93.	92.25	93.	92.5
	288....						93.	92.5	91.75	93.	92.5
Pasteurized Butter.											
47	293....	93.	93.5	93.	93.5	93.					
	295....	92.5	93.	92.5	93.	92.					
48	294....						92.	93.	92.5	93.	91.5
	296....						93.	92.	91.5	93.	92.5
51	301....	92.	92.5	93.	89.	92.					
	303....	92.5	93.	91.75	87	92.5					
52	302....						93.	93.	91.5	92.	92.5
	304....						93.	92.	91.5	93.	92.5
55	309....	93.	92.	92.5	93.	93.					
	311....	93.	93.	91.	92.5	93.					
56	310....						93.	92.5	92.5	92.	92.5
	312....						93.	92.	92.	93.	93.
59	317....	94.	93.	92.25	92.5	92.5					
	319....	94.	93.	92.5	90.	92.5					
60	318....						93.5	93.	92.5	93.	92.5
	320....						93.5	92.5	92.	92.	93.
63	325....	93.	93.	92.	92.	92.5					
	317....	93.	93.	92.75	93.	93.					

Table 20—Continued.

Pasteurized Butter.											
High moisture and low fat.							Low moisture and high fat				
Judges	No	1	2	3	4	5	1	2	3	4	5
Churn	Tub										
No.	No.										
64	326....						93.5	93.	91.75	92.	92.5
	328....						93.	92.5	91.5	87.	93.
67	333....	91.	92.	90.5	87.	90.5					
	335....	90.5	91.5	90.5	86.	90.					
68	334....						90.5	90.	90.	86.	90.
	336....						92.	91.5	91.	89.	90.5
71	341....	93.5	91.	91.5	93.	92.5					
	343....	93.	93.	92.75	93.	93.					
72	342....						92.	92.	91.5	92.5	92.5
	344....						93.	92.	90.5	92.	93.
75	349....	93.	93.5	92.5	92.	93.					
	351....	93.	93.	92.	93.	92.5					
76	350....						93.	93.	90.5	93.	92.
	352....						93.	93.	92.5	93.5	92.5
79	357....	92.5	92.5	92.5	92.5	92.5					
	359....	93.5	93.	92.5	87.	92.5					
80	358....						93.	93.	93.	92.	92.
	360....						93.	93.	92.5	92.	92.
Average.....		92.75	92.71	91.91	91.7	92.4	92.78	92.41	91.88	92.25	92.34

Table 21. Effect of Composition on Quality of Butter for Immediate Consumption, Based upon Average of all Scores for Each Day's Make, as Recorded in Table 20.

Pasteurized				Unpasteurized			
Churn No.	High water	Churn No.	Low water	Churn No.	High water	Churn No.	Low water
1	92.82	2	92.92	3	93.05	4	92.55
5	92.87	6	92.77	7	91.90	8	92.30
9	91.42	10	91.42	11	91.90	12	92.50
13	91.80	14	92.22	15	92.05	16	92.45
17	92.45	18	92.07	19	92.45	20	92.75
21	92.85	22	92.60	23	92.30	24	92.00
25	92.65	26	92.70	27	92.85	28	92.65
29	92.50	30	92.30	31	92.42	32	92.15
33	92.05	34	92.30	35	91.87	36	92.50
37	92.20	38	92.65	39	92.40	40	93.00
41	92.30	42	92.35	43	91.70	44	92.65
45	91.90	46	92.25	47	92.90	48	92.40
49	92.30	50	91.80	51	91.52	52	92.40
53	91.55	54	92.25	55	92.60	56	92.55
57	92.75	58	92.62	59	92.62	60	92.75
61	92.27	62	91.90	63	92.72	64	91.97
65	89.25	66	88.95	67	89.95	68	90.05
69	92.67	70	92.70	71	92.82	72	92.10
73	72.75	74	92.32	75	92.75	76	92.60
77	92.05	78	92.25	79	92.10	80	92.55
Average			92.17				92.16
							92.29
							92.34

Table 22. Effect of Consumption on Quality of Butter in Storage Based Upon Average of Eight Scores by Four Judges on Each Day's Make.

Pasteurized				Unpasteurized			
Churn No.	High water	Churn No.	Low water	Churn No.	High water	Churn No.	Low water
1	91.81	2	92.31	3	91.00	4	91.75
5	92.06	6	91.68	7	91.00	8	90.50
9	90.00	10	91.18	11	90.50	12	90.68
13	91.37	14	91.00	15	91.12	16	91.25
17	91.75	18	91.37	19	91.37	20	90.81
21	91.32	22	91.75	23	91.31	24	90.00
25	91.06	26	91.40	27	91.37	28	88.81
29	91.65	30	90.93	31	90.62	32	90.50
33	91.28	34	91.62	35	91.06	36	90.50
37	91.81	38	91.50	39	90.68	40	91.37
41	91.25	42	91.00	43	90.50	44	90.31
45	90.37	46	91.37	47	90.68	48	90.43
49	91.62	50	91.31	51	91.06	52	91.06
53	91.32	54	91.87	55	91.50	56	91.56
57	91.50	58	91.12	59	90.12	60	91.56
61	90.87	62	91.37	63	90.87	64	90.87
65	89.82	66	88.50	67	89.62	68	88.12
69	92.00	70	91.62	71	91.31	72	91.00
73	91.43	74	91.31	75	91.43	76	90.93
77	90.87	78	89.43	79	89.06	80	86.93
Average	91.22		91.18		90.81		90.50

Inasmuch as considerable data were at hand concerning composition and its relation to quality, the above data are presented. The same scores are used in another bulletin.

The number of churnings and tubs are the same as recorded in preceding tables. The 160 tubs of butter were scored July 14, 1908. The first tubs of butter were made May 6, and the last lot July 1. Each judge worked independently and duplicate tubs were not known. Table 21 is a summary of Table 20 based upon average of the ten scores placed upon the two tubs of butter representing the same churning. In Table 13, the butter in every other churn beginning with one has a higher water content than the butter in the succeeding churn. Hence, 40 churnings of but-

ter made from pasteurized and unpasteurized cream of a higher water content are compared with 40 churnings of butter made from corresponding lots of cream, with a lower water content. Table 22 is the same comparison except that the averages for the butter from each churn are based upon the scores by four judges, and placed upon the 160 tubs of butter January 13, 1909, or six months after first scoring.

Average of all scores showed no difference in quality. On a certain day the butter made to contain the higher water content might receive the highest average score, while the opposite would be true on another day.

Reasonable variation in composition does not affect quality.

Summary.

1. There is a variation in the water content, ranging from 0.1 to 1.0 per cent, between different samples representing the same butter. The average variation is about 0.5 of one per cent.

2. There was no variation in water content between half worked and worked butter, or after the third revolution of the churn until working was completed.

3. There was no difference in composition of samples taken from the middle or either end of the churn.

4. The per cent of water in butter is affected by the make of churn.

5. There was no difference in composition of butter made from cream held 1 to 3 hours and that held 12 to 15 hours at churning temperature.

6. Butter of the same composition can be made from either pasteurized or unpasteurized cream.

7. Dry and wet salting methods are identical as far as composition is concerned.

8. Churning of butter washed with water, differing ten degrees in temperature, produced butter with an average difference in water content in 40 comparisons of 1.99 per cent.

9. In churning 7,241.16 pounds of butter fat in 56 different churnings; according to analyses of samples taken from 108

tubs, 7,154.43 pounds of fat were recovered in the butter, giving a difference of 1.23 per cent.

10. In another comparison covering a period of two months the butter fat delivered according to the testing of 1,494 deliveries of milk and cream was 17,995.84 pounds; according to the test of the 40 different vats of cream before starter was added, 17,863.83 pounds; according to test after starter was added 17,853.84 pounds of butter fat were churned in the 80 churnings. This made a total of 21,123 pounds of butter. According to analysis of one sample taken from each churning 17,668.6 pounds of butter fat were recovered. According to samples taken from four tubs packed from each churning 17,851.4 pounds of butter fat were recovered. Difference between butter fat churned according to test after starter was added and analyses of tub samples was 0.07 per cent.

11. The approximate composition of a quantity of butter according to test after starter was added and analyses of tub samples.

12. In terms of averages, samples taken from the butter in the churn will contain nearly one per cent more moisture than samples taken from the butter in the tubs. The same decrease is true of samples taken from tubs of butter before and after storage.

13. Two lots of butter each represented by 40 churnings, two tubs of butter from each churning, with an average difference in water content of 1.99 per cent were identical in quality.

14. It is possible to make butter from day to day of uniform and desired composition.

SOME MISTAKES OF THE DAIRYMAN FROM A CHEESE MAKER'S VIEW POINT.

By

J. R. Biddulph, Tiskilwa.

During the past forty years I have been engaged in cheese making and have had an abundant opportunity to observe, what I term, mistakes made by the dairyman, as he conducts the business of dairying on the farm. Take for illustration the man who wants to put on a number of cows to produce milk for the cheese factory. In the first place, he must purchase cows. It is not an easy matter to discern between the good and the poor cow, though there are points to be considered in making the selection; however, we will discuss the subject in this way. He has purchased, say ten or fifteen cows; he milks the herd for one season, during which time he has made no attempt whatever to learn the real value of any individual cow in the herd. There may have been a fair average amount of milk from the herd, but he does not know which is the profitable one and which is the unprofitable. The only way to determine the value of a cow for the factory or for the creamery is by testing the milk.

Every up-to-date cheese factory man has what is known as the Babcock Milk Test. In my mind the only way to get at the real value of each cow is to have the cheese maker make an individual test of each one; though the dairyman may have to pay a small fee to have this work done. There may be in the herd one, two or three cows which are being kept at a loss. The thing to do is to weed out these unprofitable ones and replace them by good ones. It costs no more to feed a good cow than it does a poor one.

Another mistake made by some dairymen is this: Plans are made for cows to be fresh in February. This I consider a

mistake. I am not an advocate of winter cheese making. The time for cows to be fresh is from March 15 to April 1. A cow can be kept at less expense with less labor for the dairyman if she begins to produce milk when the spring opens. Grass will be abundant for the first few months, during which time she needs no extra feed. After the summer advances and the dry season comes, then is the time when the cow needs attention—in fly time. No cow should be neglected at this time. A quantity of good feed should be provided. There are people who think grain wasted if fed during the summer season to cows which are used for the dairy. Again, there are those who feel that while the milk flow may be decreased, yet the quality of this will be greater. This is a mistake; with the decreased flow of milk comes the decrease in quality. A light feed at this season of the year will be found to much advantage to the careful observer. If nothing is put in the cow surely nothing will be realized from her.

Bran which can be purchased at an approximate price of \$1.40 per hundred is very beneficial. I would suggest that the dairymen plan to have green sweet corn during the dry season, to keep cows up in milk until fall feed starts.

Again, there are dairymen who advocate the creamery when the skimmed milk can be utilized to raise calves. My experience has been that calves raised on skimmed milk are not profitable. Skimmed milk tends to retard the growth of calves. Instead of calves growing into money during the first season, we have the contrary result.

My patrons claim that whey fed to hogs is profitable. A hog will thrive on whey and I maintain that the careful feeding of whey to the herd of hogs will produce greater results than to attempt the raising of calves on skimmed milk. Again, I have observed that where the whey has been fed to hogs, in a community quite general, there has never been the disease so common to hogs, called cholera.

Many patrons think that during the spring and fall of the year when the weather is cool, milk needs little attention. This

is a mistake. The milk should be aerated, cooled properly when the weather is cold just as it should be when it is hot.

The matter of cleanliness is of great importance if the patron desires the best results produced at the factory. The cheese maker can not remedy the milk after it gets to him if it is allowed to become tainted at the dairy yard. Many patrons are so careless with their milk; they do not even strain it, feeling that the straining process it passes through at the factory will be sufficient. When milk is left over night it should certainly be left in as clean condition as possible. Milk should never be left where it will come in contact with odors from the barn or the dairy yard.

I will give you the amount of milk from one of the patrons for nine months, as I am no advocate of winter cheese making.

I received 37,957 milk average test 3.72-100 and the average amount of cheese from a pound of butter fat was 2.70-100, making 3,782 pounds of cheese, and the average price received 14 1-3 cents per pound, making \$542.08. Now, the question will be asked, how do they market their cheese? Well, they bring their milk to the factory and it is weighed in and then conducted to the vat and made up into cheese; then the fifteenth of every month the dividend is made out and the patrons get their tickets showing how much they have and they take that to the store where they sold their cheese and get their money, as they make their contract in the spring at some of these stores at 1/2 a cent less than the Chicago market on the first fifteenth of every month. So in that way the patrons don't have anything to do with the cheese, as the merchant brings his boxes to the factory and gets it.

Directors' Meeting

Reports of Secretary and Treasurer. Auxiliary Meetings.

GEO. CAVEN, Secretary

Directors of the Association held two important meetings last year, one being at the State Fair the first week in October and the other at Edwardsville Feb. 24th, during the annual round up of the State Farmers' Institute.

The Association had been active for several years in trying to bring the State Board of Agriculture to see the need of a change in the management of the dairy building at the State Fair. It had not been a representative building and the plan proposed by the officers of the Association to the State Board was to place the dairy building in charge of A. O. Auten, a dairyman, who had made the department of cattle at the State Fair second to none in this country. That change was made by the State Board of Agriculture prior to the 1909 fair and Mr. Auten appointed, at the recommendation of the officers of the State Dairymen's Association; Mr. Chas. Gilkerson, a dairyman at Marengo, his assistant in charge of the building.

Mr. Gilkerson had gone to work with the idea of making the dairy building at the fair truly representative of the dairy industry of the state, and all who visited the Illinois State Fair of 1909 will admit that a wonderful change was effected. Mr. Auten entered into the work advising and giving his influence to get things accomplished. Needed changes were made in the building, the most important of which was the installation of an adequate refrigerator.

State Fair week in the dairy building was not an exhibition alone, but dairy lectures and practical demonstrations for in-

struction were given to appreciative dairymen who crowded all the space set apart for the people to see and hear.

The State Dairymen's Association for the first time maintained a booth at the dairy building and in it showed up-to-date dairy scenes and pictures of profitable dairy animals of the different breeds.

A leading feature of the dairy building exhibition was made by the State Food Department, who had been induced to co-operate with the Dairymen's Association to increase the interest along pure dairy products. Under the direction of Mr. John B. Newman of Elgin, Assistant State Food Commissioner, the department made an excellent and most instructive exhibition that attracted thousands of visitors.

All the features of last year's display and instruction in the dairy building are being enlarged upon and new features are being added to make the dairy building at this year's State Fair an even greater source of attraction and instruction.

Directors of the Dairymen's Association met in the Association's booth at the State Fair, decided to hold the 1910 convention in Vandalia and made such arrangements as were necessary in preparation for the meeting.

The meeting at Edwardsville was for the election of a Secretary and Treasurer. Both Treasurer Chas. Foss of Cedarville and Secretary Geo. Caven of Chicago were re-elected without opposition.

On motion the President appointed E. Sudendorf of Clinton and Chas. Gilkerson of Marengo to act with himself as a committee to audit the reports of the Secretary and Treasurer.

On motion the President, Secretary and E. Sudendorf were appointed a committee to locate the 1911 convention, the directors expressing their preference for Elgin as a place of meeting, the State Fair never having held an annual convention in that dairy center. Communications from Oakdale and Camp Point asking for the 1911 meeting had been read and Mr. Joseph Newman presented the invitation from Elgin.

On motion the President and Secretary were authorized to hold auxiliary or one day meetings at points they thought favorable.

Moved and carried that the Secretary confer with Mr. A. O. Auten as to premium from the State Dairymen's Association at the State Fair and that the Secretary be given power to act.

Moved and carried that whereas the situation in connection with the dairy department at the University of Illinois is very unsatisfactory to the Association, President Wiggins be instructed to see Dean Davenport of the College of Agriculture and express the wishes of the Association in this matter and that the President be empowered, if he deems it advisable, to call the Board of Directors into the hearing.

The matter of letting the contract for printing the annual report was left to the President and Secretary. Adjourned.

The report of the Secretary and Treasurer for the year which reports have been approved by the auditing committee, are as follows:

TREASURER'S REPORT FOR YEAR ENDING JULY 1, 1910.

RECEIPTS.

July 1st, 1909. Balance to hand.....	\$ 743.11
Sept. 25, 1909. From Geo. Caven for state appropriation	2,500.00
Dec. 24, 1909. From Geo. Caven.....	25.00
Feb. 7, 1910. From Geo. Caven	187.50
Feb. 19, 1910. From Geo. Caven	185.00
March 5, 1910. From Geo. Caven	9.80
March 12, 1910. From Geo. Caven	76.90
March 28, 1910. From Geo. Caven	15.60
April 2, 1910. From Geo. Caven	10.00
April 16, 1910. From Geo. Caven	5.00

\$3,757.91

DISBURSEMENTS.

1909.

Voucher No.

Sept. 22.	S. B. Shilling, meeting Camp Point	17	\$21.00
Sept. 22.	L. N. Wiggins, meeting Camp Point	18	25.00
Sept. 22.	Geo. W. Ingersoll, printing 2,000 letter heads printing 300 circulars	19	10.25
Oct. 12.	A. F. Jansen, meeting Springfield.....	20	12.45
Oct. 12.	E. Sudendorf, auditing committee.....	21	8.40
Oct. 12.	Geraghty & Co., 500 buttons State Fair.....	22	8.00
Oct. 12.	Geo. W. Ingersoll, 1 M envelopes.....	23	2.25
Oct. 12.	L. N. Wiggins, State Fair expenses	24	34.98
Oct. 12.	Geo. Caven, expenses Springfield meeting..	25	26.44
Nov. 10.	Chicago Dairy Produce, half tones for report, etc.	26	5.15
Nov. 10.	Tripp & Co., card signs State Fair	27	26.25
Nov. 10.	Chas. Gilkerson, State Fair expenses	28	30.30
Nov. 10.	E. F. Harrison, butter premiums State Fair..	29	3.45
Nov. 10.	Wm. J. Kane, butter premiums State Fair ..	30	3.45
Nov. 10.	Robert Moren, butter premiums State Fair..	31	3.37
Nov. 10.	G. P. Saver, butter premiums State Fair....	32	3.37
Nov. 10.	C. E. Mortenson, butter premiums State Fair	33	3.37
Nov. 10.	O. E. Holland, butter premiums State Fair..	34	3.33
Nov. 10.	F. McFarland, butter premiums State Fair..	35	3.33
Nov. 10.	Geo. S. Dobbie, butter premiums State Fair..	36	3.32
Nov. 10.	M. L. Musselman, butter premiums State Fair	37	3.32
Nov. 10.	Pioneer Creamery Butter Co., butter premi- ums State Fair	38	3.32
Nov. 10.	Geo. McBride, butter premiums State Fair..	39	3.32
Nov. 10.	Ursa Creamery Co., butter premiums State Fair	40	3.32
Nov. 10.	L. R. Weckerly, butter premiums State Fair	41	3.25
Nov. 10.	John Mortenson, butter premiums State Fair	42	3.25
Nov. 10.	Leland Hotel Farm, butter premiums State Fair	43	3.25
Nov. 12.	W. B. Barney & Co., 1st prize Holstein cow..	44	5.00
Nov. 12.	F. E. Eger & Son, 1st prize Holstein heifers	45	5.00
Nov. 12.	J. P. Latimer & Co., 1st prize Jersey cow...	46	10.00
Nov. 12.	J. P. Latimer, 1st prize Jersey heifer.....		
Nov. 12.	J. F. Converse & Co., 1st prize Ayershire cow		
Nov. 12.	J. F. Converse & Co. 1st prize heifer.....	47	10.00
Nov. 12.	E. M. Barton, 1st prize Brown Swiss cow...	48	5.00
Nov. 12.	Jos. Allyn, 1st prize Brown Swiss heifer...	49	5.00
Nov. 12.	John H. Williams, 1st prize Guernsey cow		
Nov. 12.	John H. Williams, 1st prize Guernsey heif- er	50	10.00

Nov. 12.	Stockwell & Gifford, 1st prize Dutch Belt cow	51	5.00
Nov. 12.	F. R. Sanders, 1st prize Dutch Belt heifer..	52	5.00
Nov. 12.	L. A. Sties, 1st prize market and certified milk	53	10.00
Nov. 12.	Leland Hotel Farm, 1st prize cream	54	5.00
Nov. 12.	Geo. Caven, one-half salary as Sec. '09-'10..	55	150.00
Nov. 12.	Chas. Foss, Springfield meeting	56	11.92
Dec. 10.	Geo. Caven, Secy., \$50.00 premium butter, \$50.00 mailing annual reports	57	100.00
Dec. 10.	W. B. Barney & Co., sweepstakes premium..	58	15.00
Dec. 20.	S. B. Shilling, auxiliary meeting Greenville and Highland	59	41.00
Dec. 20.	F. E. Eager & Son, sweepstakes prize	60	15.00
1910.			
Jan. 24.	Greenduck Co., badges Vandalia convention.	62	50.80
Jan. 25.	Elgin Dairy Report, 500 entry blanks, 850 programs, 1,000 posters	63	59.00
Jan. 25.	Low's Circular Letter Service, 800 multi-graph letters	64	4.50
Jan. 25.	Lowrie & Black, printing and publishing 1,000 reports and cuts	65	759.93
Jan. 25.	N. P. Hull, Vandalia convention	66	39.75
Jan. 25.	N. W. Hepburn, Vandalia convention	67	6.12
Jan. 25.	F. A. Jorgenson, Vandalia convention....	68	12.07
Feb. 5.	L. N. Wiggins, Vandalia convention.....	69	15.13
Feb. 5.	W. L. Gaines, expense Greenville and Highland meetings	70	10.20
Feb. 5.	J. F. Sanmann, expense Vandalia meeting..	71	16.00
Feb. 5.	Chas. Foss, expenses Vandalia meeting....	72	13.00
Feb. 5.	W. J. Fraser, expense Vandalia meeting....	73	7.05
Feb. 5.	E. Sudendorf, expense Vandalia meeting	74	3.87
Feb. 28.	E. Sudendorf, expense Edwardsville meeting	75	10.75
Feb. 28.	Chas. Gilkerson, state fair exhibit, auxiliary meetings, Marengo and Huntley, convention Vandalia and Edwardsville	76	47.76
Feb. 28.	O. F. Hunziker, Vandalia program	77	27.65
Feb. 28.	H. R. Wright, Vandalia program	78	24.67
Feb. 28.	Chas. Foss, Edwardsville expense.....	79	16.81
Feb. 28.	Alice Donahue, stenographic work.....	80	10.00
Feb. 28.	Geo. Caven, second half salary '09-'10.....	81	150.00
March 7.	Mrs. Augusta Potts, stenographic report Vandalia convention and expense....	82	91.07
March 7.	Jos. Newman, Edwardsville meeting.....	83	21.36
March 7.	W. G. Morstrom & Co., medals 1909-1910..	84	30.00
March 12.	Louis Johnson, pro rata and butter.....	85	3.40
March 12.	Louis Neilson, pro rata and butter.....	86	6.24
March 12.	Geo. Cutler, pro rata and butter	87	12.00

March 12.	E. T. Moore, butter Vandalia	88	5.60
March 12.	H. L. Moore, pro rata and butter	89	9.60
March 12.	C. A. Fields, butter Vandalia	90	7.00
March 12.	Robert Moren, pro rata Vandalia.....	91	7.00
March 12.	P. H. Jacobson, pro rata butter	92	15.60
March 12.	Arthur Maule, pro rata Vandalia	93	7.00
March 12.	N. A. Peterson, pro rata Vandalia and butter	94	7.60
March 12.	Wm. J. Kane, pro rata Vandalia butter	96	14.60
March 12.	L. R. Weckerly, pro rata premiums Vandalia	97	11.00
March 12.	Ferdinand Grimm, pro rata and butter ..	98	16.40
March 12.	M. S. Martin, pro rata and butter	99	10.40
March 12.	F. J. Weddige, pro rata butter	100	10.60
March 12.	A. A. Adams, pro rata butter	101	14.60
March 12.	Geo. W. Hoppensteadt, pro rata butter....	102	20.60
March 12.	Wm. Englebrecht, pro rata butter.....	103	9.60
March 12.	Frank McFarland, pro rata butter	104	16.40
March 12.	Geo. A. Schafer, pro rata butter	105	6.25
March 12.	E. J. Mattson, pro rata butter	106	3.25
March 12.	A. R. Stickles, pro rata butter	107	9.00
March 12.	Mrs. W. M. Stanley, pro rata butter.....	108	6.25
March 12.	R. M. Pennington, pro rata butter	109	3.25
March 12.	Chas. Foss, pro rata butter	110	11.00
March 12.	F. S. Morse, pro rata butter.....	111	4.50
March 12.	J. C. Candle, pro rata butter	112	3.50
March 12.	J. C. Causey, pro rata butter	113	6.00
March 12.	J. D. Ryan, pro rata butter	114	5.00
March 12.	J. F. Turner, pro rata butter	115	1.25
March 12.	C. A. Cunningham, pro rata butter.....	116	6.25
March 12.	L. A. Spies, premium on milk	117	10.00
March 12.	Lester Sturm, premium on milk	118	4.00
March 12.	J. C. Causey, premium on milk.....	119	5.00
March 12.	E. J. Mattson, premium on milk	120	3.00
March 12.	C. E. Cox, premium on milk	121	3.00
March 12.	Leland Hotel Farm, premium on cream..	122	5.00
March 12.	K. B. Carpenter, premium on butter and milk	123	25.00
March 12.	N. A. Peterson, premium on butter.....	124	12.00
March 12.	R. J. Collier, premium on butter	125	14.00
March 12.	Chas. Foss, premium on butter	126	6.00
March 12.	E. T. Moore, premium on butter and milk	127	10.00
March 12.	M. G. Hollgrave, premium on butter	128	3.00
March 12.	T. H. Hussmann, premium on milk	131	1.50
March 12.	John Abisher, premium on milk	132	1.50
March 12.	J. R. Biddulph, premium cheese	133	19.00
March 12.	Chas. Fields, premium milk	134	12.00
March 12.	Louis Nielson, premium milk	135	15.00

March 12.	K. B. Carpenter, pro rata and butter	136	18.60
March 16.	Joseph Newman, expense Vandalia meet- ing	137	15.00
March 16.	T. J. Julian, expense Vandalia meeting..	138	35.91
March 16.	Charley Fields, error in returns for butter	139	3.00
March 16.	A. F. Jansen, expense Vandalia and Ed- wardsville meetings	140	9.61
March 18.	N. W. Hepburn, expense Greenwood meet- ing	141	12.98
March 31.	The Elgin Dairy Report, printing.....	142	2.65
March 31.	S. B. Shilling, expense Hebron and Rich- mond meetings	143	14.68
March 31.	Chas. Gilkerson, expense Hebron and Rich- mond meetings	144	12.80
May 18.	J. R. Biddulph, for old order No. 2, April 5, 1909	145	10.00
May 18.	Geo. Caven, traveling expenses to date from July 1st, '09	146	89.71
May 18.	Lowrie & Black, shipping reports and 1 M. letter heads	147	19.14
May 18.	A. F. Jansen, expense Altamont meeting....	148	7.00
Total			\$2,766.32
Total cash received for year to July 1, 1910.....			\$3,757.91
Total disbursements for year to July 1, 1910			\$2,766.32
Balance on hand July 1st, 1910			\$ 991.59

Respectfully submitted.

(Signed) CHAS. FOSS, Treasurer.

Approved:

L. N. WIGGINS,
E. SUDENDORF,
CHAS. GILKERSON,

Auditing Committee.

SECRETARY'S REPORT

Chicago, Ill., July 16, 1910.

To Directors Illinois State Dairymen's Association:

Dear Sirs—I hereby submit the Secretary's financial report for the year, July 1st, 1909, to July 1st, 1910:

RECEIPTS.

From L. N. Wiggins, President, check from State Treasurer....	\$2,500.00
Memberships	155.00
Check Treasurer	26.44
Colonial Salt Co.	5.00
Chr. Hansen's Laboratory	10.00
Sharples Separator Co.	10.00
City of Vandalia	200.00
Sale Banquet Tickets	25.00
Sale Butter	4.00
International Salt Co.	20.00
DeLaval Separator Co.	35.00
Vermont Farm Machine Co.	25.00
Elgin Butter Tub Co.	10.00
Blanke & Hauk	5.00
Diamond Crystal Salt Co.	10.00
Worcester Salt Co.	10.00
Check Treasurer	100.00
A. H. Barber Creamery Supply Co.....	10.00
Wells & Richardson Co.	15.00
J. B. Ford Co.	20.00
Creamery Package Mfg. Co.	25.00
Sharples Separator Co.	9.81
Merrill & Eldredge (for butter)	76.90
Geo. Caven (for butter)	5.60
John Newman Co. (for butter)	5.60
Sturges & Burn Mfg. Co.	10.00
International Harvester Co.	10.00
Empire Cream Separator Co.	5.00
Check Treasurer	89.21
Check Treasurer, to balance	25.64

 \$3,458.19

EXPENSES.

Check from L. N. Wiggins to Treasurer Foss	\$2,500.00
Printing proofs and score cards	5.48
Express	14.23
Telegrams and telephone	2.85
Drayage	2.75
Traveling expenses July 1, '09, to July 1, '10	101.71
Stamps, including mailing of 250 reports	77.31
Auditing Committee	3.90
Rubber stamp and pad	.50
Envelopes for reports and programs	7.40
Labor	2.00
Paid Treasurer Foss	514.88
State Fair premiums	50.00
Legal paper	.95
Expense speakers and officers Vandalia convention	110.00
T. J. Julian (advanced expense cash)	20.00
Chas. Gilkerson (advanced expense cash)	5.96
Cloth for stereopticon	2.24
Butter room expense	6.50
Machinery hall expense	4.05
Photo for report	1.00
Signs	11.00
Miscellaneous	6.61
Chicago Dairy Produce, balance on cuts	3.20
N. W. Hepburn, Oakwood expense	3.75
	\$3,458.19

GEO. CAVEN, Secretary.

Approved:

L. N. WIGGINS,

E. SUDENDORF,

CHAS. GILKERSON,

Auditing Committee.

Auxiliary Meetings.

The Association has continued its policy of holding auxiliary meetings, or one-day conventions, in the state and the results of meetings last year were gratifying. Meetings were held at Richmond, Marengo, Altamont, Effingham, Greenwood, Highland and Greenville. A meeting to be held at Oakland was a disappointment. It was announced at a time in the early spring when farm work was pressing and the speakers engaged for the meeting did not attend, with the exception of N. W. Hepburn, in charge of dairy manufactures, University of Illinois. The attendance of farmers was good. At all the other meetings the attendance was excellent. Following are reports of some of these meetings:

RICHMOND, MARCH 25

The sessions held at Memorial hall in this village last Friday in the interests of the dairymen of this section were both interesting and instructive. Coming at this time of year, which is a busy one for farmers who are getting things in readiness for their spring work, the meetings were not as largely attended as could have been desired, but despite this drawback the attendance at both sessions was satisfactory. The speakers present were perhaps the most practical that have ever talked upon farm subjects in Richmond and those who had charge of the gathering as well as those who attended were well pleased at the outcome of the sessions.

At the afternoon session J. B. Newman, Assistant State Pure Food Inspector, gave an extended address on "Clean Milk as an Article of Food." He contended that milk, at the present price, was the cheapest food on the market, and suggested that the farmers would do well to advertise milk as an article of food, thus increasing the demand for it, and consequently, by creating a greater demand, secure a better price. He laid stress upon

the necessity for farmers to keep their barns and barn yards as clean as possible, and of the value of sun light in the barn as a germ killer.

Mr. Chas. Gilkerson of Marengo also gave a very interesting talk on "Keeping the Children on the Farm."

A much larger audience was present in the evening, when Chairman J. I. Lang called the meeting to order and introduced the first speaker, D. L. James of Urbana, who discussed the subjects, "Cow Test Association" and "Breeding and Feeding." Mr. James advised the farmers to keep a record of the amount of milk given by each individual cow, and at the end of the year to dispose of those cows giving the smallest quantity of milk. He also advised the raising of the calves from the best milkers.

S. B. Shilling, formerly President of the National Dairy Union, gave a very interesting talk on "The Value of Silos," declaring that a silo added thirty-five per cent to the value of corn as food for stock.

Misses Gates and Singleton and Mrs. J. I. Lang rendered solos during the evening session which were much appreciated by the audience.

AT A MARENGO MEETING

The meeting of the Illinois Auxiliary State Dairymen's Association was held Friday afternoon in the city hall in Marengo. The meeting had been worked up and was presided over by Charles Gilkerson, one of the directors of the Association, and was one of great interest and instruction throughout, not only to the dairymen and farmers present, but also to the citizens of the town, who had the privilege of attending.

The Association had the honor of having present at this meeting its youngest member, Master Sherman Crissey, 13 years old, son of A. A. Crissey. He is a member in good and regular standing and manifested as much interest and understanding of the questions discussed as many of the older members.

Mr. Gilkerson introduced Hon. J. P. Mason of Elgin, President of the Illinois State Farmers' Institute, and President of



H. R. WRIGHT,
State Dairy and Food Commissioner
DesMoines, Iowa.

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the Producers' Association, who spoke on the subject of milk production. He said that farmers must have better cows. The cows must have better care, thereby insuring better milk, and naturally better prices for the milk. Mr. Mason has produced 10,000 cans of milk in one year from his dairy, and in one year cleared \$10,000. He told of an experiment in feeding steers and hogs. At the end of the year he sold them for \$10,000. Then he changed to dairying and at the end of the year had sold \$10,000 of milk, and had his working material—his dairy—left, whereas in the first instance his working material was gone. Showing plainly the profit in a well managed dairy.

The next speaker of the day was Hon. J. B. Newman of Elgin, Assistant State Pure Food Commissioner. Some of the special points he made were on the value of milk as a food. He spoke of the important part it plays in a person's diet, and showed how essential it was that it should be more sanitary—how, with proper care there would be much less bacteria in milk, which is a well known medium for the spreading of certain diseases. He urged that the stables must be better lighted and have better ventilation, and that there be a better degree of cleanliness of both stable and cattle, and that the cattle have better food. A dairy run on this basis would have no trouble in commanding better prices for the milk.

George W. Conn, County Superintendent of Schools of McHenry county, gave a rousing address. He spoke of the changed conditions on the farm at the present time as compared with a few years ago. The electric railway, the telephone, the rural free delivery of mail, putting the farmer in touch with the world equally as well as his city brother. He said that the farmer is the real aristocrat of the day. He urged that there be a concentrated effort among the farmers to better all conditions of farm life. Farmers, he said, could work well single, but they had not learned to work well double, as yet, which they must do to make things move on. There can be no retrogression now.

Prof. DeLos L. James, of the University of Illinois, talked

of the difference between good and poor cows. He said that few farmers really knew the difference between their good and poor cows. The only way to distinguish them is the scales and the Babcock test. He advised using pure bred sires and raising calves from the best cows and thus breed up the dairies to a high standard.

An attempt is being made to organize a cow-testing association in this vicinity. A good start has been made, and the outlook for one in the near future is very promising. The association is described to be as follows:

Twenty-six dairymen unite for the purpose of having their cows tested for the production of butter fat. Each dairyman pays from 50 cents to \$1 a cow, and a competent man is furnished by the university, who goes about among the members of the association, staying a day at a time, and going once a month for twelve months.

While with the dairyman he tests the milk, night and morning, of each cow, weighs the feed and consults with the owner on all essential points. At the end of the year he figures up just how much each cow has consumed, and just how much butter fat each one has produced, thereby showing the farmer which cows are profitable. The association owns the testers, each farmer his own scales, and the man's salary is paid from the membership fee. The association is to hold for one year.

After the addresses were given many stayed to question and compare notes, showing their interest in these vital matters was genuine.

ALTAMONT, APRIL 23

Meeting called to order, with an introductory address by Director A. F. Jansen about the present situation and development, the advantage and possibilities of dairying for Effingham County in particular, and this section of the State in general.

Next speaker introduced was L. A. Spies, President of Union Dairy Co. of St. Louis. He followed an introductory talk by going into detail about the several phases of successful

dairying; how he had cleared a farm in his younger days of timber land, and after considering everything on all sides, finally concluded to go to dairying, in order to make the most out of it. Mr. Spies still owns and operates a dairy farm at St. Jacobs, Ill., where he produces certified milk for his dairy company in St. Louis. He has probably the highest butter fat test producing herd of Holsteins that can be found anywhere. Nothing less than 3.6 is allowed to stay in the herd and he has some that have 5 per cent butter fat.

After the address, a general discussion was entered upon, which brought out a great many needed and practical hints and information, especially in regard to the silo question, as that is a prominent one in the dairy business.

EFFINGHAM, MARCH 31

Meeting called to order by President G. W. Hirtzel of the County Dairy Association.

Minutes of last meeting read by Mr. Goldstein, Secretary of the Association. Minutes approved as read.

First speaker introduced was M. A. Began, Superintendent of Van Camp Condensory. He spoke in a very interesting way about the present situation, regarding dairying, inasmuch as the home condensing factory was concerned. He gave facts and data about several things of importance to farmers; sending milk to the factory; how everything considered, it was fairly satisfactory, but plenty of room left yet for improvement; how and why the milk should be produced under more sanitary conditions, etc.

At the close of his address he gave the prices for the next six summer months, which were satisfactory to the patrons of the factory.

Next speaker introduced was Samuel DeBaer, experienced Holstein cattle breeder, buyer and shipper for the Van Camp Co. at Effingham. He gave some valuable information about dairying in Holland, he having been born and raised in Holland. He

told how the dairy farmers of Holland were making money in the dairy business out there on \$300 to \$400 per acre land.

The local Director of the State Dairy Association, A. F. Jansen, was then called upon to make a talk. He responded with a short talk about the gradual development of the dairy industry around Effingham; how far we had advanced and what was to be done in the future to keep abreast of the times as it further developed. After distributing the annual report of the State Dairy Association's doings the meeting adjourned.

State Fair Premiums.

The Association special premiums at the State Fair were awarded as follows:

LOT 101—COWS 3 YEARS OLD OR OVER

First to W. B. Barney & Co., Hampton, Iowa, on Wietske Ormsby DeKol 64,605.

LOT 102—HEIFERS UNDER 3 YEARS.

First to F. E. Eager & Son, Howell, Mich., on Netherland Cornucopia Wayne DeKol 96,654.

LOT 103—BEST POSITIONS IN TEST.

Holstein-Friesian cow 3 or over, to W. B. Barney & Co., on Wietske Ormsby DeKol 64,605.

Holstein-Friesian heifer under 3, to F. E. Eager & Son, on Netherland Cornucopia Wayne DeKol 96,654.

Jersey cow 3 or over, to J. F. Latimer & Co., Abingdon, Ill., on Toltec's Flossy 192,903.

Jersey heifer under 3 to J. F. Latimer & Co., on Goldina A 214,745.

Ayrshire cow 3 or over, to J. F. Converse & Co., Woodville, N. Y., on Boghall Snowdrop.

Ayrshire heifer under 3, to J. F. Converse & Co., on Enid Fizzaway.

Brown Swiss cow 3 or over, to E. M. Barton, Hinsdale, Ill., on Belle Windsor 1,764.

Brown Swiss heifer under 3, to Jos. Allyn, Delavan, Wis., on Louise 3647.

Guernsey cow 3 or over, to John H. Williams, Waukesha, Wis., on Eagle Flossie 18122.

Guernsey heifer under 3, to John H. Williams, on Mina 25137.

Dutch Belted cow 3 or over, to Stockwell & Gifford, Oxford, Mass., on Meadow Bell 1491.

Dutch Belted heifer under 3, to F. R. Sanders, Bristol, N. H., on Hazel W 1317.

LOT 235—MILK AND CREAM TEST.

The first prize awards were as follows:

Class I—Market milk, L. A. Spies, St. Jacob, Ill.

Class II—Certified milk, L. A. Spies, St. Jacob, Ill.

Class III—Cream, Leland Hotel Farm, Springfield, Ill.

The Association had offered a special pro rata purse of \$50 on creamery butter and the same amount on dairy butter. The creamery butter purse was divided as follows:

CREAMERY BUTTER.

	Score.	Am't.
E. F. Harrison, Warren, Ill.	95½	\$3.45
William J. Kane, Thomson, Ill.	95	3.43
Robert Moren, Morrison, Ill.	93	3.37
G. P. Sauer, East Troy, Wis.	93	3.37
C. E. Mortensen, Milledgeville, Ill.	93	3.37
O. E. Holland, Morrison, Ill.	92½	3.33
F. McFarland, Big Rock, Ill.	92½	3.33
Geo. S. Dobbie, Chicago	92	3.32
M. L. Musselman, Lanark, Ill.	92	3.32
Pioneer Creamery Butter Co., Camp Point, Ill.	92	3.32
George McBride, Scales Mound, Ill.	92	3.32
Ursa Creamery Co., Ursa, Ill.	92	3.32
L. R. Weckerly, Dakota, Ill.	90	3.25
John Mortensen, Chadwick, Ill.	90	3.25
Leland Hotel Farm, Springfield, Ill.	90	3.25

The purse of \$50.00 on dairy butter was distributed among 69 exhibitors, the amounts ranging from 40 cents to \$2.70.

The Association plans to continue its one-day conventions, the work to be taken up early this fall and as many meetings as possible will be held.

THE SEEDING OF COWPEAS, CLOVER AND GRASSES**By****M. F. Miller.**

SEEDING OF ALFALFA**By****C. B. Hutchinson.**

Bulletins from Missouri Station.

The great value of cowpeas as a feed and as a soil renovating crop should give them a more important place in Missouri agriculture. The short period of growth also makes it possible to use them to great advantage as a catch crop between the regular crops in the rotation, either for hay, for pasture, or for turning under. They are therefore, especially suited to the man who wishes to build up land rapidly while he is at the same time securing a return from it in feed. The crop is one which will undoubtedly become of much greater importance in Missouri as the land is farmed more intensively.

Time of Seeding.

There is a wide range in the time at which cowpeas may be sown, even in the same locality. In Central Missouri the best time to sow them for hay or seed, is about the first of June. A mistake is frequently made in sowing them early in May, since a period of a few cool days after they are up is sure to stunt them and prevent the best growth. The ground must be warm before they are put in. They may be sown as late as the first week in July in Central Missouri while in the extreme southern part of the state, peas sown the middle of July will usually give fair results. As a general rule they should be sown in most parts of the state between the first and the fifteenth of June.

Methods of Seeding.

The method of seeding peas depends upon the use which is to be made of them. For hay they should as a rule, be sown with a grain drill at the rate of four to five pecks per acre. Some men put in as much as two bushels, and while this gives a finer texture to the hay, it usually reduces the amount of seed formed. On the other hand, they are often sown at the rate of three pecks per acre, but excepting for seed purposes, or on land particularly adapted to the crop, such as the low lands of Southern Missouri, this is rarely enough. A small seeded variety like the New Era will require less seed per acre than the larger seeded varieties like the Whippoorwill.

For seed purposes, cowpeas are best sown somewhat thinner than for hay, three pecks usually being better than five. They should not be broadcasted either for hay or for seed on the uplands of the state. Such a method is wasteful of seed and uncertain as to a stand. They may also be sown for seed with the corn planter and cultivated, making the rows the same distance apart as for corn or the rows may be placed at half the distance of corn rows, by going over the land twice and straddling every other row. In this case, they are more difficult to cultivate as the rows are too close together for convenient cultivation. It is usually necessary in this case to take off one shovel on each gang of a six shovel cultivator and if the axle is adjustable, to so set the wheels as to avoid running on two rows while cultivating a third.

Peas sown at the usual rate for hay, generally make a good yield of seed in favorable seasons. As a matter of fact, the yield of the threshed peas depends not only upon the season, but also upon the soil and the variety. A medium to thin soil will produce more seed than a rich soil and a sandy soil more than a clay soil as a rule. Varieties like the New Era which is early and which has little tendency to vine, will yield more peas than a later vining variety like the Clay.

Another method of putting in peas in rows, is by means of a grain drill where a part of the holes are stopped. Where every

third hole is allowed to run and care is used in driving, the rows can be placed about 32 inches apart which is a good distance.

Harvesting.

Cowpeas for hay or seed should be cut with a mower and if the weather is favorable, they may be cured in the swath. This method is not usually satisfactory however, as the leaves break off badly in raking up, especially if one or two rains should fall while they are curing. When cured in this way a hay tedder can be used with much benefit in hastening the curing.

A better way of curing in average seasons, is to cut them in the evening or on a cloudy day so as to allow the leaves to evaporate as much water as possible before drying, and when well wilted, rake into light windrows to cure. A side delivery rake can be used to great advantage in turning these windrows if the peas are not too viny. They may also be placed in rather tall narrow shocks after they are partially cured and allowed to finish curing in the shock.

Peas planted in rows usually fall down badly and are much more difficult to cut than where drilled. If they have been cultivated the ridges of soft dirt interfere somewhat. There is on the market, a device consisting of long fingers which are placed on the mower to lift the peas and allow the cutter bar to run under them.

Threshing Cowpeas.

Cowpeas can be threshed with perfect success only with a pea or bean huller. A wheat thresher may be used but it cracks the peas so badly as to make it impractical except for some of the smaller seeded varieties. A wheat thresher may be modified so as to give fair satisfaction by using a large pulley on the cylinder so as to reduce the speed, while the rest of the machine is geared up to run at the usual rate. A part of the concave teeth may also be removed with good results, but these are only makeshift methods and a pea huller should be used if available. In this connection it should be said that the introduction of pea hullers should be encouraged in all parts of the state where peas

are grown. The average yield of peas is about 9 to 10 bushels per acre. They may run as low as 6 bushels or as high as 25 bushels.

Cowpeas in the Corn.

Cowpeas may be seeded in the corn at the last cultivation or they may be put in the rows when the corn is planted. In the first case, they are best drilled in with a one horse drill at the rate of two or three pecks per acre when the corn is laid by. To be sure of a stand it is best to lay by the corn a few days earlier than usual. They may be broadcasted and plowed in but this method is not so sure of securing a stand as is the method of drilling them.

Where planted in the row the best plan is to use a special cowpea planting attachment on the corn planter. These attachments are now on the market. In this case, a gallon and a half of peas should be used. The difficulty of putting peas in the row is that corn is usually planted about two weeks before it is entirely safe to sow peas. This plan is very commonly practiced however. Peas planted in this way will make more seed than where they are sown at the last cultivation and are especially valuable for hog pasture. Many men find it very profitable to hog down both corn and peas. The New Era or Whippoorwill varieties may be used where they are to be hogged down or a vining variety which will twine about the stalks may be used and both corn and peas cut with a corn binder.

Varieties.

For hay the Whippoorwill, the Clay and the New Era varieties are commonly used. The New Era is an early variety and is best where they are put in as a catch crop rather late. Both the Whippoorwill and the New Era produce a good amount of seed although the New Era is usually the highest yielder. The Black pea is a good general purpose pea resembling the Whippoorwill somewhat in character of growth and in seed production. The Clay is a later vining variety good for forage but not a heavy seed producer under Missouri conditions.

Clover and Timothy.

The most common meadow mixture in Missouri is that of red clover and timothy. Where these are sown together with a nurse crop of small grain, the first crop of hay is usually secured the year following the harvesting of the nurse crop, although on the best lands a fair crop of clover may sometimes be secured the same year they are seeded. The first year's crop is usually almost pure clover and the second about an equal mixture of clover and timothy, and if left a third year will be almost pure timothy. The most common method of seeding this mixture is with wheat or oats as the nurse crop. Where wheat is used, the timothy may be sown in the fall with the wheat, sowing the clover in the spring. The rate of seeding should be from eight to ten pounds of timothy and six to eight pounds of clover. In this case, the clover is usually sown in late February or early March broadcast, sowing this some morning when the ground is "honey-combed" with frost and before it thaws. Other methods are used by many farmers but this seems to be the most generally successful.

Where timothy is not fall sown a better practice but one which requires more labor and greater judgment, is to wait until the ground is dry enough to harrow, usually in March or early April, broadcast both clover and timothy and harrow in. This method is surer than any other if the ground dries sufficiently early to crumble well under the harrow and the harrowing will also be of benefit to the wheat. The difficulty comes in catching the ground in the proper condition for harrowing but the practice is to be recommended where the soil dries sufficiently early to allow it. Where timothy has been fall sown, however, it is not wise to harrow in the clover in the spring on account of injury to the young timothy plants.

Where timothy and clover are put in with oats broadcast, they may be sown at the same rates recommended above and all harrowed together. This practice is not entirely satisfactory, however, either for the oats or for the clover and timothy. A

much better plan is to drill the oats, sowing the timothy and clover from the grass seeder on the drill or broadcasting them ahead of the drill. Where oats are broadcasted the best plan is to harrow in the oats either with a disk or drag harrow then broadcast the clover and timothy and harrow again lightly, covering the seed from a quarter to a half inch deep.

Clover and timothy may both be sown in the fall but clover is quite uncertain when put in at the same time as the wheat. It is best sown earlier, either in the corn in late summer or on a specially prepared seed bed. When sown in the corn it should be worked in with a small harrow or drag. It is rarely possible to get an even stand when sown in the corn, and the land is usually left rough for the clover meadow the next year. Where a special seedbed has been prepared, clover and timothy may be seeded together in late summer or early fall without a nurse crop. This will give a good yield of mixed hay the next year providing the season is favorable for them to come through the winter. Clover is much more apt to freeze out, however, when it is fall sown. It is a very good practice where timothy alone is desired to seed in the fall on a specially prepared seedbed. This will give a good crop of timothy the next season if conditions are reasonably favorable.

On lands that are wet and where red clover is uncertain, the use of alsike clover is to be recommended sown at half the rate of the red. It is a short perennial clover which will last three to five years although it is only about half as large as the red. It makes a fine quality of hay but not a very heavy yield. It should be mixed with timothy where it is to be used for hay.

Mixtures for Pastures.

Where pasture is desired a mixture of timothy, red clover, alsike clover, white clover and bluegrass may be seeded, although on lands well adapted to bluegrass it is a more common practice to omit this and let it gradually come in as the land is pastured. The same can be said of white clover, although it is somewhat better practice to add both of these. In buying bluegrass seed,

special attention should be given to getting seed that is as free of chaff as possible and that germinates well. The seed should weigh at least twenty-four pounds per bushel and it should germinate at least sixty percent. Most of the difficulty that has been encountered in seeding bluegrass has been due to the fact that the greater part of the bluegrass seed on the market is of low vitality.

Where bluegrass is used a seeding of six pounds of timothy, four pounds of red clover, two pounds of alsike clover and six to ten pounds of good bluegrass seed should be sown. The grasses can be sown in the fall with wheat and the clovers in the spring or all may be sown in the spring with oats or spring barley. If white clover is desired quickly, two pounds of this should be added to the mixture. The cost of this grass and clover seed will be around \$3.00 per acre if the maximum quantity of bluegrass is used, and if the seeds are of good quality.

Orchard Grass.

In seeding down dry rocky lands, especially in South Missouri, orchard grass is one of the hardiest grasses to use. A mixture of six to eight pounds timothy, four pounds red or mammoth clover, one pound alsike clover, one pound white clover and eight to ten pounds of orchard grass will give a good pasture. The clover and timothy will give pasturage the first two or three years until the orchard grass gets started. These should be harrowed in early in the spring with a small heavy harrow, without attempting to plow the land. A bushel of oats per acre harrowed in at the same time will give some pasture the first spring. On the better places of this dry, rocky land some bluegrass seed may be added, the Canadian being more hardy than the Kentucky bluegrass.

Fertilizers.

The use of phosphates such as finely ground beef bone meal applied with the nurse crop on all lands that are rather low in fertility, and especially where clover has begun to fail, will help

materially in securing a stand of both clover and grass. The use of top-dressings of manure on the thinner spots in pastures and meadows is also to be recommended, using a manure spreader and applying the manure lightly.

Improving Old Pastures.

Where a pasture has begun to fail it can be made much more productive by drilling in with a disk drill, in early spring, a mixture of two pounds red, two pounds mammoth and one pound alsike clover, running the seed into the gashes made by the disks. If a disk drill is not available, the land may be disked, the seed broadcasted, and then harrowed. This seeding of clover greatly increases the pasturage for two or three years following and stimulates the bluegrass through the nitrogen added to the soil by the clover.

A word should be said as to the importance of using grass and clover seed of good quality. The best grades of all seeds are always cheapest in the end. The weed seeds so commonly present in the cheaper grades of seeds, together with the low vitality of these cheaper grades, especially among the grass seeds, are responsible for a large percent of the pasture and meadow troubles.

The Seeding of Alfalfa.

Alfalfa is one of the most important forage crops that the Missouri farmer is growing today. Its wide adaptability for feeding to all classes of farm animals, its high feeding value, and its beneficial effect upon the soil make it a very desirable crop to grow. The idea that it cannot be grown successfully in Missouri is largely a matter of not understanding the requirements of the plant, and as these become better understood there is no doubt but it will be grown to a greater or less degree in practically every section of the state. In the richer sections it will be grown upon the uplands, and in the less fertile sections it will be grown in the fertile valleys and bottoms.

In 1907 the Experiment Station, co-operating with farmers throughout the state, started a number of alfalfa experiments with the idea of determining the best methods of securing a stand. Some very interesting results have been obtained and in many cases the problem of securing a stand has been practically solved. From the results of these experiments the following recommendations for seeding alfalfa may be given:

Soil.

Alfalfa thrives best on a deep rich, loose and well drained soil. It takes good land to grow it without considerable care. Well drained creek and river bottoms as well as all well drained, rich uplands, especially those containing plenty of lime, grow it readily where properly handled. For the small farmer who wishes to grow only a few acres, an old feed lot will usually be found to be an ideal place for seeding. For average to thin lands, much care is necessary to secure a stand and to keep the grasses and weeds from taking it. On such lands it is useless to sow alfalfa without the liberal use of stable manure but where this is applied at the rate of 12 to 15 tons per acre to well drained soil, it can usually be grown. It is practically useless to attempt to grow alfalfa on the flat prairie soils which are poorly drained.

Inoculation.

Inoculation on all uplands that have never grown alfalfa, is generally of much benefit and usually necessary to success. This is especially true on regions where sweet clover does not grow. Where sweet clover grows commonly, the land is usually inoculated for alfalfa since this plant has the same bacteria on its roots as alfalfa. Bottom lands which overflow never need inoculating. Inoculation is best accomplished by scattering two or three hundred pounds per acre of soil from a field where alfalfa has been grown successfully and harrowing it in immediately. This soil should be applied directly ahead of the harrow and not allowed to lie exposed to the sun light for any length of time since light will kill the bacteria. Soil for inoculation may also be

dried away from the sun, sifted and drilled in with an ordinary fertilizer grain drill. Where soil cannot be readily obtained from an old alfalfa field, some taken from roadsides where sweet clover is growing will answer the purpose quite as well. Artificial cultures of these bacteria are now made which the farmer may secure, sprinkle over his seed and inoculate them in this manner. This method of inoculation is still in the experimental stage however, and is not to be recommended except in an experimental way.

The Use of Lime.

On a few soils in the state which have a tendency to sourness, the use of lime is beneficial in securing a stand of alfalfa and in some cases is necessary to success. To begin with, however, one should use lime experimentally and if possible learn to grow alfalfa on land that does not need lime. Where lime is used it should be applied at the rate of from three to four thousand pounds per acre in any convenient form except that from gas works which contains injurious compounds. Where only a small area is to be limed the ordinary barrel lime allowed to air slack or water slacked to a powder may be used. The ground limestone is the cheapest form where large amounts are to be applied. This is best applied by means of a lime distributor after plowing and before working the ground down so that the preparation of the seedbed may work the lime into the soil. For a small area however, it will be more feasible to scatter the lime from a wagon box with a shovel by hand. The creek and river bottom soils and most of the fertile uplands in Missouri need no lime.

Seeding.

Alfalfa may be sown in the spring on the very fertile lands but for average to thin lands, fall or late summer sowing is much better. From the middle of August to the middle of September is the best time for Central and North Missouri, but in the extreme southern part the seeding may frequently be done as late as the first of October. Much depends upon the weather during

August as to what time it should be sown. Frequently the first of August is better than later sowing and very good returns have been gotten by sowing in July.

Clean seed of strong vitality and free from obnoxious weeds should be used and sown at the rate of fifteen to twenty pounds per acre. Seed containing dodder should always be avoided. Twenty pounds is usually to be recommended unless the seed is very good and the seedbed in exceptionally good condition. The seed is best broadcasted and lightly harrowed in, covering to a depth of from one-fourth to one-half inch. A more even stand will be secured if one-half the seed is sown one way and the other half across this seeding. The seed may also be drilled in with the seed attachment of a grain drill allowing the hoes to cover it lightly.

On very fertile lands, alfalfa is sometimes seeded in the spring with good success, but on the thinner soils plants seeded in the spring are usually overcome by weeds and grass before they get set. Where it is sown in the spring it may be sown alone or with a light seeding of oats or barley for a nurse crop. It is sometimes sown on wheat in the spring in much the same manner as clover but this should be done only on the very best lands such as the bottom lands along the Missouri and Mississippi rivers. In fall sowing there is some danger of the plants being burned out if dry weather follows the seeding and if near a meadow the grasshoppers frequently destroy the young plants, but for ordinary upland the chances for a successful stand are much better than where spring sowing is practiced.

The seed bed must be well prepared. Young alfalfa plants are very tender and the conditions must be favorable to start them off well. For spring sowing, the ground should be plowed in the fall so as to allow it to be well settled below before seeding. In the spring, the ground should be worked down and a well pulverized seed bed prepared. For fall sowing, the ground should be plowed early, preferably in June or July, plowing deep and working down at once. It should be worked at frequent intervals until time to sow to kill all growth of grass and weeds and

conserve moisture. If late plowing is necessary the ground should be well rolled to compact it below and bring the loose soil in close contact with the bottom of the furrow. Where manure is to be used it is best applied with a spreader at the rate of ten to fifteen tons per acre and plowed under early. Cowpeas is an excellent crop to precede alfalfa, as they leave the ground in good physical condition and in fine shape for fall seeding. Where alfalfa follows this crop the manure should be plowed under before the peas as that will give it a chance to be more thoroughly worked into the soil than if applied just before seeding the alfalfa. An early maturing variety of cowpeas such as the New Era, if sown early, will mature and be ready to cut for hay by the middle of August. After the peas are removed, a good seed-bed can be prepared by thoroughly disking and harrowing the ground, which will give better results than plowing so late.

Harvesting.

One of the difficulties of handling alfalfa in Missouri is found in curing the hay, especially the first crop when the weather is not suited to hay making. A cutting of a ton or a ton and a half per acre cures very slowly when the stems are so full of water and the weather moist. In the dry climate of the west, the hay cures so quickly that it goes into the stack almost as green as when first cut, but with the moist atmosphere and frequent rains of Missouri it is practically impossible to harvest every crop without getting some of it badly bleached. The first crop is sometimes made into silage or pastured off with hogs. The best methods of curing alfalfa in this state depend largely upon the weather but it rarely happens that it can be properly cured in the swath. When allowed to lie in the swath the hay burns readily and the leaves drop off so much in raking that much of the feeding value is lost. It is usually better, therefore, to rake into light windrows when only partially cured and allow it to finish curing in the windrow or in small shocks. Hay caps are frequently used for covering the shocks and protecting them from

the rain. Where cured in the windrow the side delivery rake is of great value in turning the hay and facilitating drying.

The time to cut alfalfa may be determined by noting when the plants begin to send out small shoots near the ground. It should not be cut before these appear nor stand any length of time thereafter. These shoots usually appear with the first blooms, hence it is frequently recommended to cut when the first blooms appear.

Cultivation.

Foxtail, crabgrass and bluegrass are the worst enemies of alfalfa on most lands and especially on the thinner ones. The cultivation of the alfalfa with a disk or springtooth harrow followed by a drag harrow is usually sufficient to control these grasses. After the first year there is practically no danger of injuring the alfalfa by such cultivation, even though it be quite thorough. The cultivation should be given after the second and third cuttings where possible rather than the first.

DIRECTIONS FOR TESTING MILK ON THE FARM**(By the Babcock Method)**

H. E. McNatt, Missouri Experiment Station.

The milk of every cow varies in fat content from milking to milking and from day to day. For this reason a mixed sample covering several days is necessary to give a fair average of her milk. The sample tested should be an average of at least six milkings, and better even more. In taking the samples from the individual cows, proceed as follows: Procure as many sample jars (ordinary pint Mason fruit jars are good) as there are cows being milked. Paste a label upon each jar, upon which is written the name or number of the cow. Be sure the jars are provided with the usual rubber rings to make them air tight. Drop fifteen drops of formalin into each jar to preserve the milk. Formalin may be obtained from nearly any druggist. Put the jars with lids screwed on tightly in a safe place convenient to where the milk is strained. After a cow is milked, mix the milk in the pail by stirring or pouring into another vessel. Take a sample out with a small dipper made by soldering a piece of wire to a brass shotgun shell. Be sure the dipper is full of milk. Pour the contents of the dipper into the jar bearing the name of the animal whose milk is being sampled. Screw the lid on tightly. Do the same with each cow's milk. Repeat the process during at least six consecutive milkings.

Shake the jars gently each day so as to prevent the cream from hardening and sticking to the sides of the jar. Do not, however, shake hard enough to churn the milk.

Testing.

The apparatus necessary to make a test is as follows: A testing machine or centrifuge; a milk pipette of 17.6 c. c. capacity; milk bottles; an acid measure of 17.6 c. c. capacity; and a pair

of dividers. An entire outfit large enough for a herd of not over 20 cows can be purchased for from \$4.00 to \$9.00. In using the pipette, it will be found convenient to push a piece of pure gum rubber tubing over the large end of the pipette about one-half inch, leaving about one inch projecting. Ordinarily no rubber tubing used, the pressure of the finger on the end of the pipette regulating the outflow of the milk.

Thoroughly mix the sample to be tested by pouring back and forth from the sample jar to a clean cup or jar at least six times and until no fat is left adhering to the walls of the sample jar. Be careful not to spill any of the milk. Draw the pipette nearly full of milk by sucking with the lips. Squeeze the rubber tube above the glass until the milk is held when the lips are removed. Allow the milk to escape by varying the pressure on the rubber tube until the milk on the pipette is reached. Transfer the milk carefully to one of the test bottles. Mark the number or name of the cow on the small ground spot on the bottle. Be sure all the milk runs out of the pipette.

It is a good plan to measure out two samples for each cow, in case one bottle should be broken while making the test. The reading on the two bottles should not vary over one small space or .2 per cent.

Have some scalding hot water convenient.

Adding the Acid.

Commercial sulphuric acid is used. This may be obtained from any druggist or in large quantities from a creamery supply house.

Fill the acid measure up to the mark and pour into the test bottle. Hold the bottle in a slanting position so that the acid will run down the neck and under the milk. Rotate the bottle slightly while pouring in the acid to wash down any milk that adheres to the inside of the neck. When the acid is added, mix the milk and acid with a gentle rotary motion taking care to prevent slopping the mixture into the neck. Mix until all the white

curd has been dissolved, and until the liquid in the bottle is of a brown color.

When the acid has been added to all and mixed, the bottles are placed in the centrifuge, arranging them so as to balance. Whirl at the speed given in the directions that come with the machine. Nearly all hand machines are built to run from eighty to one hundred turns of the crank per minute. Whirl for five minutes. Stop the machine gradually. Add hot water to the bottles with the pipette until each is full to the base of the neck. Whirl again for two minutes and stop. Add more hot water until the neck of each bottle is full to within an inch of the top. Whirl again for one minute.

Reading the Test.

The neck of the standard milk test bottle is divided into ten large divisions, each of the latter into five small divisions. Each large division is one per cent, and each small division two-tenths of one per cent. If the butter fat fills three large spaces there is three per cent of fat, or three pounds of fat to the hundred of milk and would be written 3 per cent. If the fat column covers five large and two small spaces, the reading would be five and four-tenths, written 5.4 per cent.

The dividers are used to conveniently measure the length of the fat column. To do this the extreme length is taken by placing one point at each extremity of the fat column. Then without disturbing the "spread" of the dividers, one point is placed at the line on the bottle neck marked with O, and the reading made where the other point touches the scale. This method enables one to read the per cent of fat easily and accurately.

Cautions and Remedies.

If a sample coagulates before testing, start a new one, adding a few drops more formalin than at first.

Sulphuric acid destroys clothing and burns the flesh, so handle it with care. If spilled on the hands, wash off with water at once.

Keep the bottles hot while testing, and they must be hot when the reading is taken. If they become cold, place them in hot water up to within an inch of the top of the neck and leave for five minutes before reading.

If the test has been properly conducted, the fat column will be clear with no sediment present either below or above. If a white, cheesy sediment shows under the fat column, use a little more acid next time. White foam on top of the fat column is usually caused by hard water and may be avoided by using rain water.

If the fat column is dark or has black sediment below the fat, use less acid or cool the milk.

Keep the acid bottle tightly stopped with a glass or rubber stopper, as sulphuric acid absorbs water from the air and consequently becomes weaker.

In emptying test bottles, first pour out one-half the contents and shake the remainder vigorously to loosen the sediment on the bottom of the bottle. This saves labor in cleaning the bottles as the sediment is very difficult to remove, if allowed to dry on the bottom of the bottle.

Keep the neck of the test bottles clean with a brush.

It is advisable to keep a few extra bottles, one or two extra pipettes and acid measures on hand.

WHEN THE COWS COME HOME.

1. With kingle, klangle, kingle,
Far down the dusty dingle,
The cows are coming home;
Now sweet and clear, and faint and low,
The airy tinklings come and go,
Like chimings from some far off tower,
Or patterings of an April shower
That makes the daisies grow—
Ko-king, ko-clang, kokingle-linge,
Up through the darkening dingle
The cows come slowly home.
2. With ringle, rangle, ringle,
By twos, and threes, and single,
The cows are coming home.
Through the violet air we see the town,
And the summer sun a-slipping down;
The maple in the hazel glade
Throws down the path a longer shade,
And the hills are growing brown.
To-ring, to-rang, toringle-ringle,
By threes, and fours, and single,
The cows come slowly home.
3. With a kingle, klangle, kingle,
With a loo-oo, and moo-oo, and jingle,
The cows are coming home;
And over there on Merlin hill,
Hear the plaintive cry of the whippoorwill;
The dew drops lie on the tangled vines,
And over the poplars Venus shines,
And over the silent mill.
Ko-ling, ko-lang, kolingle-linge,
With a ting-a-ling and jingle,
The cows come slowly home.

—Mrs. Agnes E. Mitchell.

THE CARE OF MILK AND THE MAKING OF BUTTER

By

A. B. Graham, Superintendent of Agricultural Extension, in Missouri
Agricultural School.

Eggs may be kept for many days, meat can be preserved for months, vegetables and fruits can be placed in cold storage or in a cellar for a long time, or preserved in cans indefinitely, but of all the farm products milk requires the most care to prevent deterioration. Eggs should be kept where the least amount of air can penetrate them; meats must be covered with brine or smoked to prevent the entrance of bacteria that cause decay or they must be kept under such a cold temperature that the same kind of bacteria cannot live; vegetables must be kept in cold places for like reasons; fruit should be carefully handled so that the skins may not be broken and bacteria enter the pulp; a cool place in an earth mound, cellar, or cold storage room should be provided to prevent the multiplying of harmful bacteria. Since milk is a liquid into which dirt may fall and carry not only filth but bacteria that will cause it to sour quickly, great need is required to prevent the entrance of anything that will cause it soon to lose its good qualities. Dirt will dissolve in milk just as salt or sugar will dissolve in water.

In the first place, there needs to be extreme care taken that there be as little dirt as possible on the body of the cow and the udder. In some of the large dairies each cow is given a bath before milking; this may not be practical in all cases but since the small dust particles from the cow carry both filth and bacteria, it does emphasize the necessity for bedding dairy cows well and rubbing off the dust prior to milking. No pains should be spared to clean the teats and udder with a damp cloth. The prac-

tice of a few milkers of sticking their fingers into the milk to dampen the teats is to be condemned. The milker's hands should be washed clean before he begins to milk and loose dirt, hairs, etc., should be brushed from the clothing. Whenever milking is done near the roadside from which a cloud of dust may be sent by a gust of wind into the milk and onto the milker, both bacteria and dirt are added to the milk. Dust that flies into the air during the time of throwing down hay, straw, etc., will contribute its share in assisting the milk to lose its good qualities. Festoons of cobwebs and dust-covered joists add to the dirt sources already named.

Persons using an open milk pail expect to remove all dirt by straining through a fine wire screen or through a few thicknesses of thin goods. Since the most harmful dirt that enters milk is dissolved, it is quite as impossible to remove it by straining as it would be to strain the salt out of water in which it has been dissolved. After reasonable care has been taken to have the cow clean, and the milker and place of milking have been given attention, the partially covered milk pail should be used. Some dairymen use a milk pail having a fine wire screen which fits into the top; on this screen is placed a layer of surgeon's cotton. This layer of cotton prevents air circulation and the entrance of the smallest particles of dust and dirt.

The introduction of bacteria into the soil may do harm or much good, depending upon what kinds are introduced. The introduction of bacteria into milk or cream may assist or prevent the bringing about of some desirable or undesirable result, depending upon the kind of bacteria allowed or encouraged to grow. Apples rot because bacteria of one kind enter through the broken skin; meat spoils from being attacked by bacteria; and milk sours from the increase of bacteria that are so easily introduced from the dirt that falls from the warm air that circulates over the pail. Neither harmful nor helpful bacteria can multiply rapidly, if at all, unless temperature conditions are proper. Much heat will destroy them or cold will check their multiplication. Milk that is kept where the temperature is low, say 40

degrees Fahrenheit, will not sour quickly because bacterial growth is prevented. Ordinary well or spring water stands at about 55 degrees Fahrenheit. Milk set in a tightly closed trough through which there is running water or a frequent change of well water, can be kept sweet for many hours, providing proper care has been given to the milking. Buckets, strainers, pans, or any other utensils with which milk comes in contact should be kept clean. In cleaning the utensils, cold water should be used first to rinse out all milk, then hot water may be safely used. If hot water is used first, it coagulates the albumen in the milk and it cannot be easily removed from the corners. All metal utensils used for milk should be so well soldered that nothing will remain in the seams at the bottom or up the sides; the joints should be well filled with solder.

One plan for keeping milk sweet is to pasteurize it. This means to heat it slowly to about 160 degrees Fahrenheit and hold it at that heat for a few minutes until the bacteria are killed; then the temperature of the milk is reduced to between fifty and sixty degrees to prevent the growth of any bacteria that may enter it from the air. Heating milk beyond 160 degrees gives it a burnt taste and an odor due to the solidifying or cooking of the albumen and the burning or caramelizing of the milk sugar. The albumen may be seen in the light scum that forms on milk that has been subjected to heat. If the scum be brownish, it is due to the caramelized milk sugar.

Milk should never be placed in a musty smelling cupboard or near cooked turnips, onions, or other foods giving off odors. Its being a liquid causes it to absorb odors very rapidly. Nor should it be placed in a cellar or other place where there are decaying vegetables, for the same reason. A cow that eats rag-weeds and other plants having peculiar odors will give to the milk a taste that often renders it unpalatable. Butter also will carry the taste of the plant eaten by the cow. Some claim that these odors may be imparted to the milk from the pollen that falls into the milk from the cow that has been feeding in fields having plants with some peculiar odor. Most odors can be driven from

the milk by heating it slowly but not to a degree that a scum of albumen is formed.

Milk may become ropery, due largely to dirty vessels, or take on a color, usually pink, from harmful bacteria which enter it. The natural color of milk may be very light or of a light yellow; neither color indicates the richness of the milk as that is indicated by the butter fat content. The color may satisfy the eye but nothing short of the Babcock Milk Tester will determine the per cent of butter fat.

The cream may be separated from the warm milk by the use of the cream separator. The great advantages in the use of such a machine come from one being able to feed the warm skimmed milk immediately and securing practically all of the cream for the making of butter. The most common method of securing the cream is to allow the globules of fat to rise to the surface of the milk and then skim them off. Much of the cream is stirred up and again mixed with the milk. If the milk is fed there is not such a great loss; such as there is need not be if a better method of cream gathering were practiced. Creaming by setting deep and narrow cans in cold water is one of the best methods. The milk is usually withdrawn from a small faucet in the bottom of the can; by removing the milk in this way, the cream is not mixed with it again. After removing all the milk, the cream may be drawn off. This process is known as deep setting. Another method, but one not to be recommended, is by water dilution. The adding of water to cause the cream to rise lessens the feeding value of the skimmed milk; it also adds to the distance through which the small fat globules must pass in rising to the surface.

In the making of butter, it is necessary to allow the cream to ripen. Here again, bacteria do their work. Cream may be attacked by still other kinds of bacteria and conditions and flavors brought about that are undesirable. The kind of bacteria that multiply under certain temperature conditions determine the characteristics of the cream or butter.

To ripen the cream to give the butter the most acceptable

flavor, it is necessary to introduce the desirable bacteria before the undesirable get a hold. In commercial butter a "starter" containing the desirable bacteria, is put into the cream. In farm butter-making a little buttermilk, kept for the purpose, can be used as a "starter" but it is best to have clean cream from clean milk kept at the proper temperature for ripening. Cream should not be kept long before churning that a large quantity may be accumulated. Much better butter can be made if the cream is not allowed to age too long and acquire undesirable qualities. Butter made from old cream has a musty or moldy odor.

Cream should be kept cool up to the time of the introduction of the "starter" or when the ripening process should begin. As the ripening begins the temperature should be between 65 and 70 degrees to give the best conditions for a rapid growth of desirable bacteria. As soon as the cream acquires a mild sour taste and a granular condition the temperature should be lowered to prevent the fermentation being carried further. The cream is then ready for churning.

Churning is simply a process of beating together the fat globules into grainy masses. One of the best churns is the common wooden or earthen barrel churn. Dashers or any other sort of agitation or beating arrangement need not be used to get the best results. The cream should not occupy over one-half of the churn capacity. There needs to be ample room for the cream to be thrown from one end of the churn to the other as it is turned over and over.

The churning should be done at as low temperature as is reasonable. If it is done at a high temperature, the fat globules run together more like oil and the butter has an oily or salvy appearance. There will also be a great loss of butter globules in the buttermilk. The low temperature, say 50 to 54 degrees for summer and three or four degrees higher in winter for factories and 55 to 60 degrees for the farm, will give the most desirable body and result in the complete removal of butter from the buttermilk. It usually takes much longer to churn at a low temperature than at a high one. Any churn, which is claimed to make

butter in one or two minutes, is not worth consideration; nor is one which is said to churn a pound of butter from a quart of ordinary cream. The use of hot water may hasten the coming of the butter but it causes the butter to lose in quality. Hot water and other things that may be added to hasten the butter making process cannot take the place of the proper ripening of the cream that is so necessary to the making of good butter.

In the use of the old up-and-down churn and other dasher styles of churn, it was thought necessary to gather the butter by slowly working the dasher until the butter granules had been beaten into large masses. In the up-and-down style of churn the butter must be "gathered" to that degree that the dasher is entirely supported by the butter. In this so-called process of gathering, there has been entirely too much beating after the formation of the small butter globules to make butter of the proper constituency. Instead of "gathering" it, the process should stop as soon as the butter granules are formed. The buttermilk should be drawn off and enough pure water of buttermilk temperature poured upon the butter to wash the buttermilk out thoroughly. It should then be salted and well worked to remove the remaining buttermilk. The working should not be carried so far that the butter loses its texture.

Other things being equal, the person who makes butter into pound packages will receive more for it, for the merchant can handle it at no loss from chipping as needs to be done in cutting a pound or two pounds from a large roll.

Cleanliness and proper temperature are essential conditions for having good milk and for the making of good butter.

THE ILLINOIS COMPETITIVE COW TEST.

By

C. C. Hayden.

The dairy cow is the mother of the dairy industry, and without good mothers the industry must fail.

For years the Illinois Agricultural Experiment Station has been assisting dairymen throughout the state in keeping yearly records of milk and butter fat produced by the individual cows in their herds. A limited number of bulls have been loaned to persons who have been keeping records, and in other ways all possible has been done to encourage the breeding and rearing of better cows, and better methods of feeding. As a result of this work, some dairymen have increased the production of their herds over 2,000 pounds of milk and 80 pounds of butter fat per cow per year. This shows the value of knowing what the individual cows in the herd are doing.

In order to stimulate a more widespread interest in breeding, and better methods of feeding, the Illinois Competitive Cow Test has been arranged, and it is hoped that dairymen from all parts of the state will take advantage of this opportunity to find out what their cows are doing. In order to start this competition, \$1,000 has been contributed by Mr. Burrige D. Butler, Publisher of the *Prairie Farmer*, of Chicago, as prizes for the cows producing the largest amount of butter fat in one year. Other special prizes have been offered, as shown on page 274. The object of this circular is to explain the plan of, and give the rules governing this competition.

Plan of Competition.

Any cow, whether grade or pure-bred, owned by a resident of Illinois, may be entered in this competition. Realizing that many of the best cows will not be in a condition to enter the test

this fall, it has been decided to hold the entries open for one year and complete the test two years from the time of starting. Entries may be made at any time between October 1, 1910, and October 1, 1911.

A two-day test, as described in the rules, will be made each month by a representative from the Station, and the owner must keep a careful daily record of the amount of milk produced. These tests will be conducted in such a manner that, for pure-bred cows, they will be accepted by the different Breed Associations for admission to the advanced registry or registry of merit. Owners should bear in mind that such cows must be registered before entering the test.

The following charges will be made by the Station to partially defray the expenses of conducting the competition. Persons entering cows for the competition, and also for advanced registry or registry of merit, of the different Breed Associations, will be charged a fee of \$5 per month. All others will be charged \$2.50 per month. In addition to the above, the owner will be required to furnish accommodations for the supervisor of the test, to convey him to and from the railroad station, to pay notary fees and express charges on apparatus, where these are necessary. These charges cover any number of cows owned by one person, that can be tested in two days, according to rule 6.

Rules Governing the Competition.

1. Any cow, grade or pure-bred, owned by a resident of the State of Illinois is eligible to entry. Cows entered in the competition shall be tested for two consecutive days each month. The supervisor of the test shall see the cow milked out clean at the beginning of each two days, and the last milking shall close just forty-eight hours after the close of the preliminary milking.

2. The supervisor shall make his monthly visits without previously notifying the owner, and, if deemed advisable, shall be at liberty to make a second call within the same month.

3. The owner shall weigh each milking for the month, and record the weights on a sheet provided by the Station, which sheet shall be forwarded to the Station not later than the fifth day of the following month, when a report of the month's credit will be returned to the owner.

4. The owner shall furnish a detailed statement, at the end of each month, of the kind and amount of each kind of feed fed during the month. This feed may be estimated by weighing occasionally, or by weighing out a sufficient quantity for the entire month, and deducting any which may remain at the close. Blanks will be provided for this purpose.

5. Records for the competition may begin at any time after the fourth day from calving, and may extend into the subsequent lactation period, but shall close 365 days from the date on which they began.

6. No more than ten cows in the same herd shall be tested at one time, if milked twice daily, and no more than six if milked three or more times daily.

7. No more than one cow shall be milked at the same time while under test, and each cow shall be milked the same number of times daily during the entire month as during the days tested.

8. No cow in the test shall be fed condiments, condition powders, or drugs of any kind during the year. This does not exclude proper medical attention by a competent person when the cow is ill. In such cases, a careful statement of the condition of the cow and the drugs used shall be made over the signatures of the owner and the person treating.

9. To place immature cows on the same basis with mature cows, one percent shall be added to their records for each month they are under five years of age.

10. No prize shall be awarded to a cow which is not safely in calf within five months after the date of last calving.

11. Cash prizes offered shall be awarded as follows:—

(a) Cow any age	1st	\$150.00
	2d	100.00
	3d	50.00
(b) 5 years or over	1st	\$100.00
	2d	50.00
	3d	25.00
(c) 4 years and under 5	1st	\$100.00
	2d	50.00
	3d	25.00
(d) 3 years and under 4	1st	\$100.00
	2d	50.00
	3d	25.00
(e) 2 years and under 3	1st	\$100.00
	2d	50.00
	3d	25.00
(f) Best herd of six cows	1st	Prizes to be
	2d	announced
	3d	later

Special monthly and other prizes
as offered.

12. The maximum money paid for prizes to one person shall not exceed \$350.00.

13. Each person shall furnish acid for the test, and persons entering more than two cows should furnish a Babcock tester of not less than six bottle capacity.

14. The Station reserves the right to publish any or all of the records obtained in this competition.

15. All questions not covered by these rules shall be decided by the Chief in Dairy Husbandry at the Illinois Experiment Station and the person in charge of the competition, whose decision shall be final.

16. Application for such test shall be made to the Department of Dairy Husbandry of the University of Illinois, Urbana, Illinois, on a blank provided for that purpose.

The money offered for prizes is headed by a contribution from Burrige D. Butler, of Chicago, of \$1,000.00.

The above cash prizes are to be awarded according to rule eleven. Prizes in merchandise will be awarded according to the wish of the donor.

This is a grand opportunity for persons owning pure-bred cattle who wish to have them tested for advanced registry or registry of merit. Besides getting them tested at a low cost, they will run a chance of getting a substantial prize. It is rapidly becoming necessary that breeders of pure-bred cattle have authenticated records of their cows, if they wish to breed intelligently and sell their stock to the best advantage. Persons entering grade cows have less to gain outside of a possible prize, and the value of knowing what their cows are doing. Therefore, the charge to such persons is made only one-half as great.

The charges herein stated apply to the two-day monthly tests of cows entered in this competition, only. All other tests for advanced registry will be charged for at the former regular rates. Where a test of a cow in the competition is longer than two days, the average percent of fat for the period tested will be used as the average for the month.

The names and records of all cows producing 50 or more pounds of butter fat in 30 days will be made public each month.

No breeder who has pure-bred cows can afford to miss this opportunity. The day of short-time tests is rapidly passing. Buyers will soon be insisting on long-time, or yearly, records which have been made under normal breeding conditions.

The Department of Dairy Husbandry will be glad to give any assistance possible in feeding for these records.

Anyone desiring to enter cows in this competition should write immediately to the Department of Dairy Husbandry, University of Illinois, Urbana, Illinois, for application blanks.

NEW REVISED ILLINOIS DAIRY AND FOOD LAWS OF 1907.

(As amended in 1909.)

AN ACT *to prevent fraud in the sale of dairy products, their imitation or substitutes, to prohibit and prevent the manufacture and sale of unhealthful, adulterated or misbranded food, liquors or dairy products, to provide for the appointment of a State Food Commissioner and his assistants, to define their powers and duties and to repeal all Acts relating to the production, manufacture and sale of dairy and food products and liquors in conflict herewith.*

Section 1. *Be it enacted by the People of the State of Illinois represented in the General Assembly:*

Provision for Appointment of a State Food Commissioner and the Establishment of a State Food Department—That the Governor shall appoint a Commissioner, who shall be known as the State Food Commissioner, who shall be a citizen of the State of Illinois, and who shall hold his office for the term of four years and until his successor is appointed and qualified, and who shall receive a salary of thirty hundred dollars per annum and his necessary expenses incurred by him in the discharge of his official duties, and who shall be charged with the enforcement of all laws that now exist or that hereafter may be enacted in this State regarding the production, manufacture, sale and labeling of food as herein defined, and to prosecute or cause to be prosecuted any person, firm or corporation, or agent thereof, engaged in the manufacture or sale of any article manufactured or sold in violation of the provisions of any such law or laws. The Governor shall also appoint from time to time, as required, a Food Standard Commission, for the purpose of determining and adopting standards of quality, purity or strength, for food products, for the State of Illinois, to consist of three members, one of whom shall be the State Food Commissioner or his representative, who shall

serve without extra pay; one of whom shall be a representative of the Illinois Food Manufacturing Industries, and one of whom shall be an expert food chemist of known reputation, all to be citizens of the State of Illinois, who shall receive fifteen dollars (\$15.00) per day for a period not exceeding thirty (30) days in one year and necessary expenses incurred during the time employed in the discharge of their duties: *Provided*, that said Food Standard Commission, in determining and adopting a standard of quality, purity or strength of milk or cream, shall fix such standard as may be determined solely by the examination and test of milk or cream and the can or receptacle in which it is placed.

The said Commissioner is hereby authorized to appoint, with the advice and consent of the Governor, one Assistant Commissioner, who shall be a practical dairyman, whose salary shall be \$2,000 per annum and expenses incurred in official duties. One Chief Chemist, who shall be known as State Analyst, whose salary shall be \$2,500 and expenses incurred in the discharge of official duties. One Attorney, whose salary shall be \$1,800 per annum and expenses incurred in the discharge of official duties. One Chief Clerk, whose salary shall be \$1,800 per annum and expenses incurred in discharge of official duties. Said Commissioner shall also have authority to appoint five analytical chemists, whose salary shall be \$1,200 per annum each; twelve inspectors, whose salary shall be \$1,200 per annum each; and the necessary expenses incurred in the performance of their duties; three (3) stenographers at \$900 each, and one assistant clerk at \$900.

The said Commissioner shall make annual reports to the Governor not later than the 15th of January, of his work and proceedings, and shall report in detail the number of inspectors he has appointed and employed, with their expenses and disbursements and the amount of salary paid the same, and he may from time to time issue bulletins of information, when in his judgment the interests of the State would be promoted thereby.

The said Commissioner shall maintain an office and laboratory, where the business of said department may be conducted. This section shall not affect the term of office of the present Com-

missioner, and he shall be regarded as having been appointed under the provisions of this Act.

Section 2. *Power of Commissioner and Inspectors Making Inspection*—The State Food Commissioner, and such inspectors and agents as shall be duly authorized for the purpose, when and as often as they may deem it necessary for the purpose of determining whether any manufactured food complies with the law, shall examine the raw materials used in the manufacture of food products and determine whether any filthy, decomposed or putrid substance is used in their preparation. They may also examine all premises, carriages or cars where food is manufactured, transported, stored or served to patrons, for the purpose only of ascertaining their sanitary condition and examining and taking samples of the raw materials and finished products found therein; but nothing in this Act shall be construed as permitting such officers to inquire into, or examine methods or processes of manufacture, or requiring or compelling proprietors or manufacturers, or packers of proprietary or other food products, to disclose trade rights or secret processes, or methods of manufacture. Said Commissioner, inspectors and agents shall also have power and authority to open any package, can or vessel containing or supposed to contain any article manufactured, sold or exposed for sale, or held in possession with intent to sell, in violation of the provisions of this Act, or laws that now exist, or that may hereafter be enacted in this State, and may inspect the contents thereof, and may take samples therefrom for analysis. The employes of railroads, express companies or other common carriers shall render to them all the assistance in their power, when so requested, in tracing, finding or disclosing the presence of any article prohibited by law, and in securing samples thereof as hereinafter provided for.

Section 3. *Refusal to Assist Inspectors a Misdemeanor*—Any refusal or neglect on the part of such employes of railroads, express companies or other common carriers to render such friendly aid, or to furnish such samples for analysis, as provided

for in Section 2 of this Act, shall be deemed a misdemeanor, and shall be punished as hereinafter provided.

Section 4. The person taking such sample, as provided for in Section 2 of this Act, shall, in the case of bulk or broken package goods, divide the same into two equal parts, as nearly as may be, and in the case of sealed and unbroken packages he shall select two of said packages, which two said packages shall constitute the sample taken and, properly to identify the same, he shall, in the presence of the person from whom the same is taken, mark or seal each half or part of such sample, with a paper seal or otherwise, and shall write his name thereon and number each part of said sample with the same number and also write thereon the name of the said dealer in whose place of business the sample is found, and the person from whom said sample is taken shall also write his own name thereon, and at the same time the person taking said sample shall give notice to such person from whom said sample is taken that said sample was obtained for the purpose of examination by the State Food Commissioner. One part of said sample shall be taken by the person so procuring the same to the State Analyst, or other competent person appointed for the purpose of making examinations or analyses of samples so taken, and the person taking such samples shall tender to the person from whom it is taken the value of that part thereof so retained by the person taking said sample; the other part of said sample shall be delivered to the person from whom said sample is taken. If the person from whom said sample is taken has recourse upon the manufacturer or guarantor, either by operation of law or under contract for any failure on the part of said sample to comply with the provisions of this Act, then said person from whom said sample is taken shall retain, for the period of ninety days, that part of said sample so delivered to him in order that said manufacturer or guarantor may have the same examined or analyzed if he so desires:

Provided, that the person procuring said sample may securely pack and box that part thereof retained by him and send the same to the State Analyst, or other competent person appointed

hereunder for the purpose of making examinations or analyses of samples, and his testimony that he did procure the sample and that he sealed and numbered the same, as herein provided, and that he wrote his name thereon and that he packed and boxed said part thereof and sent the same to the State Analyst, or other competent person appointed hereunder to analyze such sample, and the testimony of the person to whom said package or box is addressed that he received the same in apparent good order, that said sample was sealed, and that the number thereof and name of the sender, as herein provided for, was on said sample, and that the seal at the time the same was received was unbroken, shall be *prima facie* evidence that the sample so received is the sample that was sent, and that the contents thereof are the same and in the same condition as at the time the person so procuring said sample parted with the possession thereof, and the testimony of said two witnesses as above shall be sufficient to make such *prima facie* proof.

Section 5. *Manufacturing Adulterated or Misbranded Food Misdemeanor*—It shall be unlawful for any person to manufacture for sale within the State of Illinois any article of food or drink which is adulterated or misbranded within the meaning of this Act, and any person who shall violate any of the provisions of this section shall be guilty of a misdemeanor and, on conviction thereof, shall be punished according to the provisions of this Act:

Provided, that no article of food shall be deemed misbranded or adulterated within the provisions of this Act when intended for export to any foreign country or purchaser, and prepared or packed according to the specifications or directions of the foreign country to which said article is intended to be shipped; but if said article shall be in fact sold or offered for sale for domestic use or consumption, then this proviso shall not except said article from the operation of any of the other provisions of this Act.

Section 6. *Possession Misbranded or Adulterated Articles Prohibited*—The having in possession of any article of food or drink which is misbranded or adulterated, with intent to sell the

same, is hereby prohibited; and whoever shall have in his possession, with the intent to sell, sell or offer for sale, any article which is adulterated or misbranded within the meaning of this Act, shall be guilty of a misdemeanor, and on conviction thereof, shall be punished as hereinafter provided. Proof that any person, firm or corporation has or had possession of any article which is adulterated or misbranded shall be *prima facie* evidence that the possession thereof is in violation of this section.

Section 7. *Term Food Defined*—The term “food,” as used herein, shall include all articles used for food, drink, confectionery or condiment by man or other animals, whether simple, mixed or compound, and any substance used as a constituent in the manufacture thereof.

Section 8. *Defines Adulteration*—That for the purpose of this Act, an article shall be deemed to be adulterated—

In case of confectionery:

First—If it contains terra alba, barytes, talc, chrome yellow, paraffin, mineral fillers or poisonous substances, or poisonous color or flavor.

Second—If it contains any ingredient deleterious or detrimental to health, or any vinous, malt or spirituous liquor or compound, or narcotic drug.

In case of food:

First—If any substance has been mixed or packed with it so as to reduce or lower or injuriously affect its quality, strength or purity.

Second—If any substance has been substituted wholly or in part for the article.

Third—If any valuable constituent of the article has been wholly or in part abstracted: *Provided*, that in the manufacture of skim or separated cheese the whole or part of the butter fats in the milk may be abstracted.

Fourth—If it be mixed, colored, powdered, coated, polished or stained in any manner whereby damage or inferiority is concealed, or it is made to appear better or of greater value than it really is.

Fifth—If it contains any added poisonous or other added deleterious ingredient which may render such article injurious to health. *Provided*, that when in the preparation of food products for shipment they are preserved by an external application, applied in such a manner that the preservative is necessarily removed mechanically, or by maceration in water, or otherwise, and directions for the removal of said preservatives shall be printed on the covering of the package, the provisions of this Act shall be construed as applying only when such products are ready for consumption; and formaldehyde, hydrofluoric acid, boric acid, salicylic acid and all compounds and derivatives thereof are hereby declared unwholesome and injurious.

Sixth—If it consists in whole or in part of a filthy, decomposed or putrid, infected, tainted or rotten animal or vegetable substance or article, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal, or one that has died otherwise than by slaughter.

Section 9. *Misbranded Defined*—The term “misbranded,” as used herein, shall apply to all articles of food or drink, or articles which enter into the composition of food or drink, the packages or label of which shall bear any statement, design or device regarding such article or the ingredients or substances contained therein which shall be false or misleading in any particular; and to any such products which are falsely branded as to manufacturer, packer or dealer who sells the same or as to the state, territory or country in which it is manufactured or produced. That for the purpose of this Act an article shall be deemed misbranded—

In case of food:

First—If it be an imitation of or offered for sale under the distinctive name of another article.

Second—If it be labeled or branded so as to deceive or mislead the purchaser, or purports to be a foreign product when not so, or if the contents of the package as originally put up shall have been removed in whole or in part and other contents shall

have been placed in such package, or if it shall fail to bear a statement on the label of the quantity or proportion of any morphine, opium, cocaine, heroin, alpha or beta eucaine, chloroform, cannabis indica, chloral hydrate or acetanilid, or any derivative or preparation of any such substances contained therein.

Third—If in any package form and the contents are stated in terms of weight or measure, they are not correctly and plainly stated on the outside of the package.

Fourth—If it be a manufactured article of food or food sold in package form, and is not distinctly labeled, marked or branded with the true name of the article, and with either the name of the manufacturer and place of manufacture or the name and address of the packer or dealer who sells the same.

Fifth—If the package containing it or its label shall bear any statement, design or device regarding the ingredients of the substance contained therein, which statement, design or device shall be false or misleading in any particular: *Provided*, that an article of food which does not contain any added poisonous or deleterious ingredients shall not be deemed to be adulterated or misbranded in following cases:

First—In case of mixtures or compounds which may be now, or from time to time hereafter known as articles of food under their own distinctive names, and not an imitation of or offered for sale under the distinctive name of another article, if the name be accompanied on the same label or brand with a statement of the place where the article has been manufactured or produced.

Second—In case of articles labeled, branded or tagged so as to plainly indicate that they are compounds, imitations or blends, and the word "compound," "imitation" or "blend," as the case may be, is plainly stated on the package in which it is offered for sale: *Provided*, that the term "blend," as used herein, shall be construed to mean a mixture of like substances, not excluding harmless coloring or flavoring ingredients used for the purpose of coloring and flavoring only; and, as applied to alcoholic beverages, only those distilled spirits shall be regarded as "like sub-

stances" which are distilled from fermented mash of grain and are of the same alcoholic strength: *And, provided, further,* that nothing in this Act shall be construed as requiring or compelling proprietors or manufacturers of proprietary foods, which contain no unwholesome added ingredients, to disclose their trade formulas, except in so far as the provisions of this Act may require to secure freedom from adulteration or misbranding.

Third—In the case of mixtures of corn syrup (glucose) or corn sugar (dextrose) or corn sugar syrup, with cane or beet sugar (sucrose) or cane or beet sugar syrup, in food, if the maximum percentage of corn syrup (glucose), or corn sugar (dextrose) or corn sugar syrup, in such articles of food be plainly stated on the label.

Section 10. *Confiscation and Condemnation of Misbranded or Adulterated Foods*—Any article of food or drink or liquor that is adulterated or misbranded, within the meaning of this Act, and is being sold or offered for sale within the State of Illinois, shall be liable to be proceeded against in any circuit court, or the Superior Court of Cook county, or the municipal court of any city, or before any justice of the peace within whose jurisdiction the same may be found, and seized for confiscation by process of law or condemnation. And if such article is condemned as being adulterated or misbranded, or of a poisonous or deleterious character within the meaning of this Act, the same shall be disposed of by destruction or sale, as the said court may direct, and the proceeds thereof, if sold, less the legal costs and charges, shall be paid into the treasury of the State of Illinois and credited to the fund of the State Food Commission, to be used in the enforcement of the State Food Laws, but such goods shall in no instance be sold contrary to the provisions of this Act: *Provided, however,* that upon the payment of the costs of such libel proceedings and the execution and the delivery of a good and sufficient bond to the effect that such articles shall not be sold or otherwise disposed of contrary to the provisions of this Act, the court may, by order, direct that such articles be delivered to the owner thereof. Either party may demand trial by jury upon any

issue of fact joined in any such case, and all such proceedings shall be at the suit of and in the name of the People of the State of Illinois.

Section 11. *Vinegar to be Branded*—All vinegar made by fermentation and oxidation without the intervention of distillation, shall be branded with the name of the fruit or substance from which the same is made. All vinegar made wholly or in part from distilled liquor shall be branded "distilled vinegar," and shall not be colored in imitation of cider vinegar. All vinegar shall be made wholly from the fruit or grain from which it purports to be or is represented to be made, shall contain no foreign substance, and shall contain not less than four per cent, by weight of absolute acetic acid.

Section 12. *Extracts to be Labeled*—Extracts made from more than one principle shall be labeled in a conspicuous manner with the name of each principle, or else with the name of the inferior or adulterant; and in all cases when an extract is labeled with two or more names, such names must be in a conspicuous place on said label, and in no instance shall such mixture be called imitation, artificial or compound, and the name of one of the articles used shall not be given greater prominence than another: *Provided*, that all extracts which can not be made from the fruit, berry, bean or other part of the plant, and must necessarily be made artificially, as raspberry, strawberry, etc., shall be labeled "imitation," in letters similar in size and immediately preceding the name of the article: *Provided, further*, that prepared cocoanut, containing nothing other than cocoanut, sugar and glycerine, shall be labeled as prepared cocoanut, and when so made need not be labeled "compound" or "mixture."

Section 13. *Baking Powder—How Labeled*—No person by himself, his servant or his agent, or as the servant of any other person, shall, *first*, make or manufacture baking powder or any other mixture or compound intended for use as baking powder; *second*, or sell, exchange, deliver or offer for sale or exchange such baking powder or any mixture or compound intended for use as baking powder, unless the same shall contain not less than

ten per cent available carbon dioxide and unless the common names of all the ingredients be printed on the label.

Section 14. *Adulterated, Spirituous, Malt or Vinous Liquors Prohibited*—No person shall, within this State, by himself, his servant or agent, or as a servant or agent of any other person or corporation, manufacture, brew, distill, have or offer for sale, or sell any spirituous or fermented or malt liquor, containing any drug, substance or ingredient not healthful or not normally existing in said spirituous, fermented or malt liquor, or which may be deleterious or detrimental to health when such liquors are used as a beverage, and the following drugs, substances or ingredients shall be deemed to be not healthful and shall be deemed to be deleterious or detrimental to health when contained in such liquors, to-wit: Cocculus indicus, copperas, opium, cayenne pepper, picric acid, Indian hemp, strychnine, arsenic, tobacco, daniel seed, extract of logwood, salts of zinc, copper or lead, alum, methyl alcohol and its derivatives and any extracts or compounds of any of the above drugs, substances or ingredients and any person violating any of the provisions of this section shall be deemed guilty of a misdemeanor.

Section 15. *Mutilating Label Prohibited*—Whoever shall deface, change, erase or remove any mark, label or brand provided for by this Act with intent to mislead, deceive or to violate any of the provisions of this Act, shall be held liable to the penalties of this Act.

Section 16. *Sale of Unclean or Unwholesome Milk for Consumption and Unsanitary Containers Prohibited*—No person, firm or corporation shall offer for sale, or sell to any person, firm or corporation, creamery or cheese factory, any unclean, unhealthful, unwholesome or adulterated milk or cream, or any milk or cream which has not been well cooled or to which water or any foreign substance has been added, or milk or cream which has been handled or transported in unclean or unsanitary vessels or containers: *Provided*, that nothing in this section shall be construed to prevent the sale of skim milk to factories engaged in

the manufacture of skim milk products, nor the sale of skim milk under the provisions of section 19 of this Act.

Section 17. *Persons Receiving Milk to Wash Cans*—Any person, firm or corporation who receives from any other person, firm or corporation, any milk or cream in cans, bottles or vessels which have been transported over any railroad or boat line, where such can, bottles or vessels are to be returned, shall cause the said cans, bottles or vessels to be emptied before the said milk or cream contained therein shall become sour, and shall cause said cans, bottles or vessels to be immediately washed and thoroughly cleansed and aired.

Section 18. *Not to Manufacture Food from Impure or Unclean Milk or Cream*—No person, firm or corporation shall manufacture from unclean, impure, unhealthful or unwholesome milk, or from cream from the same, any article of food.

Section 19. *Sale of Skim Milk—Cans—How labeled*—No person, firm or corporation shall sell, or expose for sale, or have in his possession with intent to sell, in any store or place of business, or on any wagon or other vehicle, used in transporting milk from which cream has been removed, any such milk or milk commonly called "skim milk" without first attaching to the can, vessel or other package containing said milk, a tag with the words "skim milk" printed on both sides of said tag in large letters, each letter being at least three-fourths of an inch high and one-half inch wide. Said tag shall be attached to the top or side of said can, vessel or package where it can be easily seen.

Section 20. *Instruments for Measuring Milk and Cream Standards*—The State standard milk measure or pipettes shall have for milk a capacity of seventeen and six-tenths cubic centimeters, and the State standard test tube or bottles for milk shall have a capacity of two cubic centimeters of mercury at a temperature of sixty degrees Fahrenheit between "zero" and ten on the graduated scale marked on the necks thereof. For cream, eighteen grams shall be tested, and the standard test of tubes or bottles for cream shall have a capacity of six cubic centimeters of mercury at a temperature of sixty degrees Fahrenheit between "zero"

and thirty on the graduated scale marked on the necks thereof, and it is hereby made a misdemeanor to use any other measure, pipette, test tube or bottle to determine the per cent of butter fat where milk or cream is purchased by, or furnished to creameries or cheese factories, and where the value of said milk is determined by the per cent of butter fat contained in the same. Any manufacturer, merchant, dealer, or agent in this State who shall offer for sale or sell a cream or milk pipette or measure, test tube or bottle which is not correctly marked or graduated, as herein provided, shall be guilty of a misdemeanor and upon conviction thereof shall be punished as provided in this Act.

Section 21. *Underreading Babcock Test Prohibited*—It shall be unlawful for the owner, manager, agent or any employe of a creamery or cheese factory to manipulate or underread the Babcock test, or any other contrivance used for determining the quality or value of milk, or to falsify the record thereof, or to pay for such milk on the basis of any measurement except the true measurement, as thereby determined.

Section 22. *Sale of Preservatives Prohibited*—No person, firm or corporation shall manufacture for sale, advertise, offer or expose for sale, or sell, any mixture or compound intended for use as a preservative or other adulterant of milk, cream, butter or cheese, nor shall he manufacture for sale, advertise, offer or expose for sale, or sell any unwholesome or injurious preservative or any mixture or compound thereof intended as a preservative of any food: *Provided, however,* that this section shall not apply to pure salt added to butter and cheese.

Section 23. *Vehicles to be Marked*—Any person, firm or corporation, who shall in any of the cities, incorporated towns or villages of this State which contains a population of 5,000 or over, engage in or carry on a retail business in the sale or exchange of, or any retail traffic in milk or cream, shall have each and every carriage or vehicle from which the same is vended, conspicuously marked with the name of such vender on both sides of such carriage or vehicle.

Section 24. *Illegal Lard*—No person shall, within this State, manufacture for sale, have in his possession with intent to sell, offer or expose for sale, or sell, as lard, any substance not the legitimate and exclusive product of the fat of the hog.

Section 25. *Lard Substitute*—No person shall manufacture for sale within this State, or have in his possession with the intent to sell, offer or expose for sale, or sell, as lard, or as a substitute for lard, or as an imitation of lard, any mixture or compound which is designed to take the place of lard and which is made from animal or vegetable oils or fats other than the fat of the hog, or any mixture or combination with any animal or vegetable oils or fats, unless the tierce, barrel, tub, pail or package containing the same shall be distinctly and legibly branded or labeled with the name of the person, firm or corporation making the same, together with the location of the manufactory and the words "lard substitute" or "adulterated lard" or "compound," "imitation" or "blend," as the case may be, or unless the same shall be sold under its own distinctive name, as provided for in section 9 of this Act.

Section 26. *Persons Selling Imitation or Substitute for Lard to Inform Purchaser*—It shall be unlawful to sell or offer for sale any "lard substitute" or "adulterated lard" or "compound," "imitation" or "blend," as herein defined, without informing the purchaser thereof, or the person or persons to whom the same is offered for sale, that the substance sold or offered for sale is "lard substitute" or "adulterated lard" or "compound" or "blend," as the case may be.

Section 27. *Sale of Process Butter Not Branded Prohibited*—No person, firm or corporation, agent or employe, shall manufacture for sale, sell or offer or expose for sale, in this State, any butter that is produced by taking original packing stock butter, or other butter, or both, and melting same so that the butter fat can be drawn off or extracted, then mixing the said butter fat with skimmed milk, or milk, or cream, or other milk product, and rechurning or reworking the said mixture, or that produced by any process that is commonly known as boiled, pro-

cess or renovated butter, unless the same is branded or marked, as provided in section 28 of this Act.

Section 28. *Process Butter—How Branded*—No person, firm, corporation, agent or employe, shall sell, offer or expose for sale, or deliver to a purchaser, any boiled, process or renovated butter, as defined in section 27 of this Act, unless the words "Renovated Butter" shall be plainly branded with gothic or bold face letters at least three-fourths of an inch in length on the top and sides of each tub or box, or pail or other kind of case or package, or on the wrapper of prints or rolls or bulk packages in which it is put up. If such butter is exposed for sale uncovered, or not in a case or package, a placard containing the label so printed shall be attached to the mass of butter in such a manner as to be easily seen and read by the purchaser. The branding or marking of all packages shall be in the English language, and in a conspicuous place so as to be easily seen and read by the purchaser.

Section 29. *Illegal Food to be Seized*—Whenever the commissioner or his agents shall have ground for suspicion that any article of food, found in possession of any person, firm or corporation, is adulterated or misbranded within the meaning of this Act, he may seize such article of food and make an inventory thereof, and shall leave a copy of such inventory with the party holding such suspected goods, and tag the same "suspected;" and he shall notify in writing the person, firm or corporation in whose possession it may be found, not to offer the same for sale or sell or otherwise dispose of the same until further notice in writing from the commissioner. Whereupon the commissioner shall forthwith cause a sample of said article of food to be examined or analyzed, and if the same shall be found to be adulterated or misbranded within the meaning of this Act, the commissioner shall proceed with a hearing and subsequent proceedings as provided in this Act. If, however, such examination or analysis shall show that such article of food complies with the provisions of this Act, the person, firm or corporation in whose possession such article of food is found shall forthwith be notified in writing

that said seizure is released, and authority given to dispose of such article of food. Such seizure may be had without a warrant and said commissioner, and all inspectors and agents appointed pursuant to law, are hereby given full power and authority of "policemen." Any court having jurisdiction, upon receiving proof of probable cause for believing in the concealment of any food or dairy product or substitutes therefor, or imitation thereof, kept for sale or for a purpose, or had in possession or under control, contrary to the provisions of this Act, or other laws which now exist or may be hereafter enacted, shall issue a search warrant and cause a search to be made in any place therefor, and to that end may cause any building, enclosure, wagon or car to be entered, and any apartment, chest, box, locker, tub, jar, crate, basket or package to be broken open and the contents thereof examined.

Section 30. *Search Warrants to be Issued for Illegal Food*—All warrants issued pursuant to section 29 hereof shall be directed to the sheriff, bailiff or some constable of the county where such food or dairy products may be supposed to be concealed, commanding such officer to search the house or place where such food or dairy product, or substitute thereof, or imitation thereof for which he is required to search, is believed to be concealed, which place and the property to be searched for, shall be designated in the warrant, and to bring such food or dairy product or substitute therefor or imitation thereof, when found, and the person in whose possession the same is found, before the magistrate who issued the warrant, or before some other court or magistrate having jurisdiction of the case to be proceeded against as hereinafter provided for in section 10 of this Act.

Section 31. *State's Attorney to Assist*—It shall be the duty of the State's Attorney in any court of this State when called upon by the commissioner, or any of his assistants, to render any legal assistance in his power to execute the law and to prosecute cases arising under the provisions of this Act: *Provided*, that no person shall be prosecuted under the provisions of this Act for selling or offering for sale any article of food or drugs as defined

herein, when the same is found to be adulterated or misbranded within the meaning of this Act, in the original unbroken package in which it was received by said person when he can establish a guaranty signed by the wholesaler, jobber, manufacturer or other party residing in this State, from whom he purchased such article, to the effect that the same is not adulterated or misbranded in the original unbroken package in which said article was received by said dealer; within the meaning of this Act, designating it. Said guaranty to afford protection, shall contain the name and address of the party or parties making the sale of such article to such dealer, and in such case said party or parties shall be amenable to the prosecutions, fines and other penalties as provided for in this Act: *Provided*, that no such guaranty shall operate as a defense to prosecutions for the violation of this Act. *First*. If the dealer shall continue to sell after notice by the State Food Commissioner that such article is adulterated or misbranded within the meaning of this Act. *Second*. If the dealer shall fail to preserve for the manufacturer or guarantor and deliver to him upon demand the sample left with him by the commissioner or his agent.

Section 32. *State Board of Health to Furnish Samples*—The State Board of Health may submit to the commissioner or any of his assistants samples of food or drink for examination or analysis, and shall receive special reports showing the results of such examination or analysis.

Section 33. *State Analyst Shall Not Furnish Certificate of Purity*—It shall be unlawful for the State Analyst or any assistant State Analyst to furnish to any individual, firm or corporation any certificate as to the purity or excellence of any article manufactured or sold by them to be used as food or in the preparation of food.

Section 34. *Using Shift or Device*—The use of any shift or device to evade any of the provisions of this Act shall be deemed a violation of such provision and punishable as herein provided.

Section 35. *Master's Liability, Etc.*—Whoever shall, by himself or another, either as principal, clerk or servant, directly

or indirectly, violate any of the provisions of this Act, shall be guilty of a misdemeanor and punished as herein provided.

Section 36. *Penalties, License Fees and Proceeds Paid to State Treasurer*—All fines, penalties, and all proceeds collected from goods confiscated and sold under the provisions of this Act and other laws relating to dairy and food products, and all license fees collected hereunder, shall be paid into the State treasury.

Section 37. *Label—Size of Type*—The principal label on any package of food, as defined by this Act, shall be printed plainly and legibly in English with or without the foreign label in the language of the country where the product is produced or manufactured and the size of type, if not otherwise described in this Act, shall not be smaller than EIGHT-POINT (BREVIER) CAPS: *Provided*, that in case the size of the package will not permit the use of eight-point cap type, the size of the type may be reduced proportionately.

Section 38. *Food Commissioner to Make Rules and Regulations*—The State Food Commissioner shall make rules and regulations for carrying out the provisions of this Act, and shall have power to make rules and regulations for the analyzing and reporting the results thereof, of articles submitted for analysis by the State Board of Health, and regulating the analyzing and reporting thereon of samples taken under any law or laws of the United States by any person hereunder, or furnished by any officer or employe charged with the enforcement of the laws of the United States relative to the manufacture, sale or transportation of adulterated, misbranded, poisonous or deleterious foods, dairy products or articles manufactured from dairy products or liquors.

Section 39. *Standard of Purity and Strength*—In the enforcement of this Act, and in the construction thereof, the following named articles of food stuffs, when offered for sale or exposed for sale, or sold, shall conform to the analytical requirements set opposite each respectively:

Milk shall contain not less than three (3) per cent of milk

fat and not less than eight and one-half (8.5) per cent of solids, not fat.

Cream shall contain not less than eighteen (18) per cent of milk fat.

Maple Sugar shall contain not less than sixty-five one-hundredths (0.65) per cent of maple ash in the water-free substance.

Honey is laevo-rotatory, contains not more than twenty-five (25) per cent of water, not more than twenty-five hundredths (0.25) per cent of ash and not more than eight (8) per cent of sucrose.

Gloves shall contain not more than five (5) per cent of clove stems, not less than ten (10) per cent of volatile ether extract, not less than twelve (12) per cent of quercitannic acid, not more than eight (8) per cent of total ash, not more than five-tenths (0.5) per cent of ash insoluble in hydrochloric acid, and not more than ten (10) per cent of crude fiber.

Black Pepper shall contain not less than six (6) per cent of non-volatile ether extract, not less than twenty-five (25) per cent of pepper starch, not more than seven (7) per cent of total ash, not more than two (2) per cent of ash insoluble in hydrochloric acid, and not more than fifteen (15) per cent of crude fiber.

Lemon Extract shall contain not less than five (5) per cent of oil of lemon by volume.

Orange Extract shall contain not less than five (5) per cent of oil of orange by volume.

Vanilla Extract shall contain in one hundred (100) cubic centimeters the soluble matters from not less than ten (10) grams of vanilla bean.

Olive Oil has a refractive index (25 degrees C.) not less than one and forty-six hundred and sixty ten-thousandths (1.4660) and not exceeding one and forty-six hundred and eighty ten-thousandths (1.4680), and an iodine number not less than seventy-nine (79) and not exceeding ninety (90.)

All Vinegars shall contain four (4) grams of acetic acid in one hundred (100) cubic centimeters (20 degrees C.)

Cider Vinegar shall contain not less than one and six-tenths (1.6) grams of apple solids, and not less than twenty-five hundredths (0.25) grams of apple ash in one hundred (100) cubic centimeters (20 degrees C.)

Wine Vinegar shall contain not less than one (1) gram of grape solids and not less than thirteen-hundredths (0.13) gram of grape ash in one hundred cubic centimeters (20 degrees C.)

Malt Vinegar shall contain in one hundred (100) cubic centimeters (20 degrees C.) not less than two (2) grams of solids and not less than two-tenths (0.2) gram of ash.

In the enforcement of this Act and the construction thereof all articles of food not defined in this Act, when offered for sale or exposed for sale, or sold, shall conform to the definition and analytical requirements of the standard adopted and promulgated from time to time by the State Food Standard Commission: *Provided*, such standards for any article of food or drink, or for any substance used or intended to be used in food or drink shall be deemed *prima facie* evidence of the proper standard of quality, purity and strength of any such article or substance, but shall only be deemed such *prima facie* evidence in the trial of cases brought in the proper courts to enforce the provisions of this Act: *Provided*, that nothing in this section shall be construed to prevent the sale of any wholesome food product which varies from such standards, if such article of food be labeled so as to clearly indicate such variation.

Section 40. *Preliminary Hearing by the Commissioner*—When it appears from the examination or analysis that the provisions of this Act have been violated, the Food Commissioner shall cause notice of such fact, together with a copy of the findings, to be given to the party or parties from whom the sample was obtained; and to the party, if any, whose name appears upon the label as manufacturer, packer, wholesaler, retailer, or other dealer, by registered mail. The receipt of the postoffice department for such registered notice shall be received as *prima facie* evidence that such notice has been given. The party, or parties,

so notified, shall be given an opportunity to be heard under such rules and regulations as may be prescribed as aforesaid. Notices shall specify the date, hour and place of the hearing. The hearing shall be private, and the parties interested therein may appear in person or by attorney. If, after such hearing, the commissioner shall believe this Act has been violated, he shall cause the party, or parties, whom he believes to be guilty, to be prosecuted forthwith, under the provisions of this Act. No action or prosecution shall be instituted against any person for a violation of the provisions of this Act unless the same shall have been commenced within ninety days from the taking of said sample.

Section 41. *Penalty*—Any person convicted of violating any of the provisions of the foregoing Act shall, for the first offense, be punished by a fine in any sum not less than fifteen (15) dollars, and not more than one hundred (100) dollars, or by imprisonment in the county jail not exceeding thirty days, or by both such fine and imprisonment, in the discretion of the court, and for the second and each subsequent offense by a fine of not less than twenty-five (25) dollars and not more than two hundred (200) dollars, or by imprisonment in the county jail not exceeding one year, or both, in the discretion of the court; or the fine above may be sued for and recovered before any justice of the peace or any other court of competent jurisdiction in the county where the offense shall have been committed, at the instance of the State Food Commissioner or any other person in the name of the People of the State of Illinois as plaintiff and shall be recovered in an action of debt.

Section 42. *Judgment—Issuing Capias*—When the rendition of the judgment imposes a fine as provided in any of the sections of this Act, it shall be the duty of the justice of the peace or other court rendering such judgment also to render a judgment for costs and such justice of the peace or other court shall forthwith issue a capias or warrant of commitment against the body of the defendant, commanding that unless the said fine and costs be forthwith paid the defendant shall be committed to the jail of the county and the constable or other officer, to whose

hands said *capias* or warrant shall come, shall in default of such payment, arrest the defendant and commit him to the jail of the county, there to remain as provided in section 171 of "An Act to revise the law in relation to criminal jurisprudence," in force July 1, 1885, unless such fine and costs shall sooner be paid.

Section 43. *Repeal*—All Acts and parts of Acts inconsistent with this Act are hereby repealed:.. *Provided*, that nothing in this Act contained shall be construed as repealing the Act entitled, "An Act to regulate the manufacture and sale of substitutes for butter," approved June 14, 1897, in force July 1, 1897, or any part thereof.

Approved May 14, 1907, in force July 1, 1907.

Amendment to Section 39, approved June 14, 1909, in force July 1, 1909.

OLEOMARGARINE LAW.

AN ACT *to regulate the Manufacture and Sale of Substitutes for Butter.*

Section 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly:* That for the purpose of this Act, every article, substitute or compound or any other than (that) which is produced from pure milk or cream therefrom, made in the semblance of butter and designed to be used as a substitute for butter made from pure milk or its cream, is hereby declared to be imitation butter: *Provided*, that the use of salt and harmless coloring matter for coloring the product of pure milk or cream shall not be construed to render such product an imitation.

Section 2. No person shall coat, powder or color with annato or any coloring matter whatever, any substances designed as a substitute for butter, whereby such substitute or product so colored or compounded shall be made to resemble butter, the product of the dairy.

No person shall combine any animal fat or vegetable oil or other substance with butter, or combine therewith, or with animal fat or vegetable oil, or combination of the two, or with either one, any other substance or substances, for the purpose or with the effect of imparting thereto a yellow color or any shade of yellow so that such substitute shall resemble yellow or any shade of genuine yellow butter, nor introduce any such coloring matter or such substance or substances into any of the articles of which the same is composed: *Provided*, nothing in this Act shall be construed to prohibit the use of salt, rennet and harmless coloring matter for coloring the products of pure milk or cream from the same.

No person shall, by himself, his agents, or employes produce or manufacture any substance in imitation, or semblance of natural butter, nor sell nor keep for sale, nor offer for sale any imita-

tion butter, made or manufactured, compounded or produced in violation of this section, whether such imitation butter shall be made or produced in this State or elsewhere.

This section shall not be construed to prohibit the manufacture and sale, under the regulations hereinafter provided, of substances designed to be used as a substitute for butter and not manufactured or colored as herein provided.

Section 3. Every person who lawfully manufactures any substance designed to be used as a substitute for butter, shall mark by branding, stamping or stenciling upon the top or side of each box, tub, firkin or other package in which such article shall be kept, and in which it shall be removed from the place where it is produced, in a clear and durable manner in the English language, the word "oleomargarine," or the word "butterine," or the words "substitute for butter," or the words "imitation butter," in printed letters in plain Roman type, each of which shall not be less than three-quarters of an inch in length.

Section 4. It shall be unlawful to sell or offer for sale any imitation butter without informing the purchaser thereof, or the person or persons to whom the same is offered for sale, that the substance sold or offered for sale is imitation butter.

Section 5. No person, by himself or others, shall ship, consign or forward by any common carrier, whether public or private, any substance designed to be used as a substitute for butter unless it shall be marked or branded on each tub, box, firkin, jar or other package containing the same, as provided in this Act, and unless it be consigned by the carriers and receipted for by its true name: *Provided*, that this Act shall not apply to any goods in transit between foreign States across the State of Illinois.

Section 6. No person shall have in his possession or under his control any substance designed to be used as a substitute for butter, unless the tub, firkin, jar, box or other package containing the same be clearly and durably marked as provided in this Act: *Provided*, that this section shall not be deemed to apply to persons who have the same in their possession for the actual consumption of themselves (or) their families. Every person who shall have

possession or control of any imitation butter for the purpose of selling the same which is not marked as required by the provisions of this Act, shall be presumed to have known during the time of such possession or control the true character and name, as fixed by this Act, of such product.

Section 7. Whoever shall have possession or control of any imitation butter or any substance designed to be used as a substitute for butter, contrary to the provisions of this Act, for the purpose of selling the same, or offering the same for sale shall be held to have possession of such property with intent to use it in violation of this Act.

Section 8. No action shall be maintained on account of any sale or contract made in violation of, or with intent to violate, this Act, by or through any person who was knowingly a party to such wrongful sale or contract.

Section 9. Whoever shall deface, erase or remove any mark provided by this Act, with intent to mislead, deceive, or to violate any of the provisions of this Act, shall be guilty of a misdemeanor.

Section 10. Whoever shall violate any of the provisions of this Act shall be punished by a fine of not less than \$50 nor more than \$200, or by imprisonment in the county jail not to exceed 60 days for each offense, or by both fine and imprisonment, in the discretion of the court, or the fine alone may be sued for and recovered before any justice of the peace in the county where the offense shall be committed, at the instance of any person in the name of the People of the State of Illinois as plaintiff.

Section 11. It is hereby made the duty of the State's Attorney of each county in this State to prosecute all violations of this Act upon complaint of any person, and there shall be taxed as his fees in the case the sum of ten dollars (\$10), which shall be taxed as costs in the case.

Approved June 14, 1897, in force July 1, 1897.

STOCK FOOD LAW.

Regulating the manufacture, sale and analysis of concentrated commercial feed stuffs for feeding farm live stock and domestic animals generally, and making it the duty of the State Food Commissioner to prosecute person or persons violating any provision of said law and fixing a license fee, etc.; approved May 18, 1905, in force July 1, 1905.

AN ACT to regulate the sale and analysis of concentrated feeding stuffs.

Section 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly:* Every lot or parcel of concentrated commercial feed stuffs, as defined in Section 2 of this Act, used for feeding farm live stock, sold, or offered or exposed for sale within this State, shall have affixed thereto, in a conspicuous place on the outside thereof, a plainly printed statement, clearly and truly certifying the name, brand or trade mark, under which the article is sold for feeding purposes, the name and address of the manufacturer, importer or dealer, the net weight of the package, and the minimum percentage of crude protein, reckoning one per cent of nitrogen equal to six and one-fourth per cent of protein, crude fiber, and crude fat which it contains; the several constituents to be determined by the methods adopted by the Association of Official Agricultural Chemists of the United States. If the feed stuff is sold in bulk, or if it is put up in packages belonging to the purchaser, the agent or the dealer shall upon the request of the purchaser, furnish him with the certified statement described in this section.

Section 2. The term "concentrated commercial feed stuff," as used in this Act, shall include cotton seed meals, linseed meals, pea meals, bean meals, peanut meals, cocoanut meals, gluten meals, gluten feeds, maize feeds, starch feeds, sugar feeds, sucrose feeds, and all oil meals of all kinds, dried distillers' grains,

dried brewers' grains, dried beef refuse, malt sprouts, malt refuse, hominy feeds, cerebine feeds, rice meals, oat feeds, corn and oat feeds, corn, oat and barley feeds, chop feeds, corn bran, ground beef or fish, scraps, meat and bone meals, mixed feeds—except as otherwise provided in Section 3 of this Act—clover and alfalfa meals, condimental stock and poultry foods, patented, proprietary or trade-marked stock and poultry foods, and all other materials of a similar nature not included in Section 3 of this Act.

Section 3. The term "concentrated commercial feed stuffs," as used in this Act shall not include hays and straws, the whole seeds nor the unmixed meals made directly from the entire grains of wheat, rye, barley, oats, Indian corn, buckwheat and broom corn. Neither shall it include wheat bran or wheat middlings not mixed with other substances but sold separately as distinct articles of commerce, nor wheat bran and wheat middlings mixed together, not mixed with any other substances, and known in the trade as "mixed feed," nor pure grains ground together unmixed with other substances.

Section 4. Any manufacturer, importer, agent or other person selling, offering or exposing for sale any concentrated feed stuffs included in Section 2 of this Act, without the printed statement required by Section 1 of this Act, or with a label stating that the said feed stuffs contains substantially a larger percentage of either crude protein or crude fat than is actually present therein, shall be fined fifty dollars (\$50.00) for the first offense and one hundred dollars (\$100.00) for each subsequent offense.

Section 5. The State Food Commissioner is hereby authorized, in person or by deputy, to enter any premises where feed stuffs are stored and to take a sample not exceeding two pounds in weight, from any lot or package of any commercial feed stuff used for feeding any kind of farm live stock or poultry, as defined in Section 2 or of excepted materials named in Section 3 of this Act, which may be in possession of any manufacturer, importer, agent or dealer. Any sample so taken shall be put in a suitable vessel and a label signed by the State Food Commissioner or his deputy, placed on or within the vessel, stating the name or

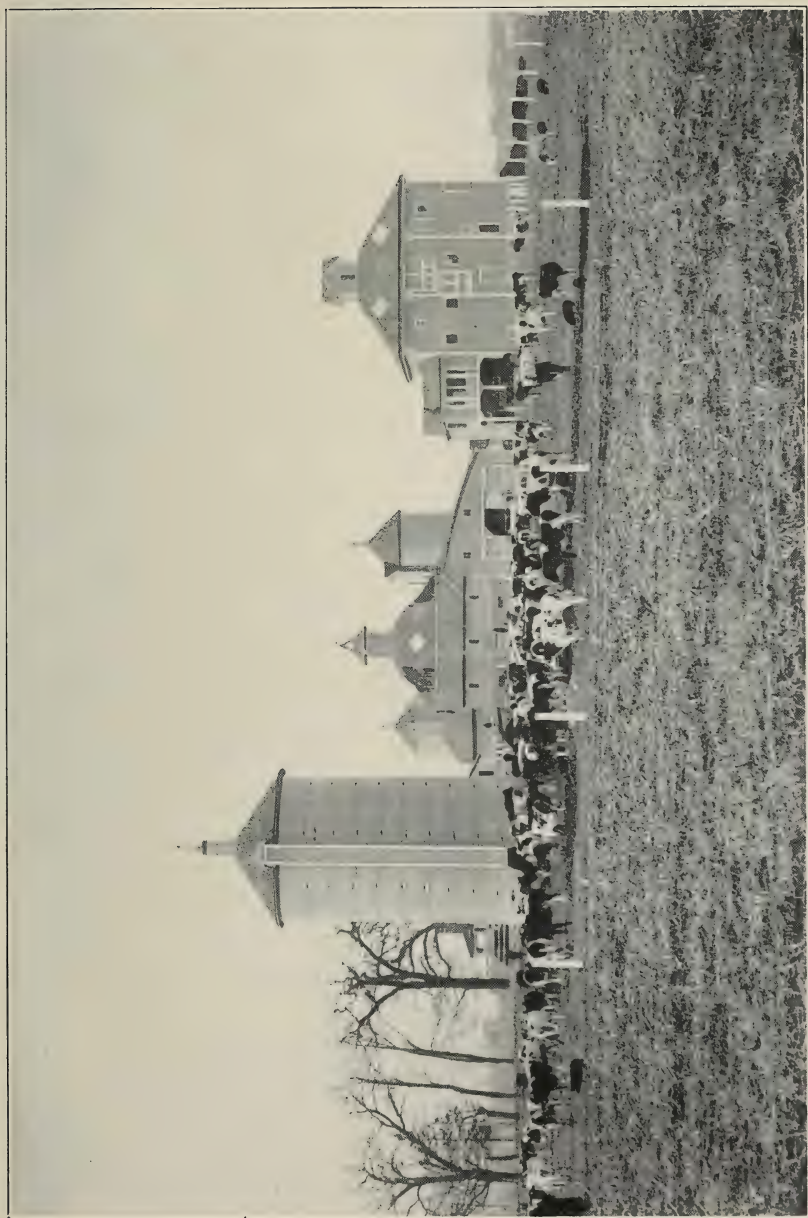
brand of the feed stuff or material sampled, the guaranty, the name of the manufacturer, importer or dealer, the name of the person, firm or corporation from whose stock the sample was taken, and the date and place of taking; *Provided, however,* that whenever a request to that effect is made the sample shall be taken in duplicate and carefully sealed in the presence of the person or persons of interest, or their representative, in which case one of the said duplicate samples shall be signed and retained by the person or persons whose stock was sampled. Any person who shall obstruct the State Food Commissioner or his deputy while in the discharge of his duty under this Act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than twenty-five dollars (\$25.00) nor more than one hundred dollars (\$100.00) for each offense. The aforesaid State Food Commissioner shall cause at least one analysis of each feed stuff collected as herein provided to be made annually. Said analysis shall include the determinations of crude protein, of crude fat, and crude fiber, and of such other ingredients as it is deemed advisable at any time to determine. Said State Food Commissioner shall cause the results of the analysis of the sample to be furnished the Agricultural Experiment Station from time to time to be published in annual bulletins or special circulars, together with such additional information concerning the character, composition and use thereof as circumstances may require.

Section 6. Any person who shall adulterate any whole or ground grain with milling or manufacturing offals, or with any foreign substance whatever, or adulterate any bran or middlings or mixtures of wheat bran or wheat middlings known in the trade as "mixed feed," or any other standard by-product made from the several grains or seeds with any foreign substance whatever, for the purpose of sale, unless the true composition, mixture or adulteration thereof is plainly marked or indicated upon the package containing the same or in which it is offered for sale and any person who knowingly sells or offers for sale any whole or ground grain, bran or middlings, or mixture of wheat bran and wheat middlings known in the trade as "mixed feed," or other standard

by-product, which has been so adulterated, unless the true composition, mixture or adulteration is plainly marked or indicated upon the package (containing) the same or in which it is offered for sale, shall on conviction, be fined not less than twenty-five dollars (\$25.00) nor more than one hundred dollars (\$100.00) for each offense and such fines shall be paid into the treasury of the State.

Section 7. It shall be the duty of the State Food Commissioner to prosecute the person or persons violating any provisions of this Act, and for this purpose the State Food Commissioner may, if necessary, employ experts, and may further designate some person connected with his office, or some other suitable person, to make complaints in his behalf; and in making complaints for violation of this Act the person so designated shall not be required to enter into any recognizance or to give security for the payment of costs: *Provided, however,* that there shall be no prosecution in relation to the quality of any unadulterated commercial feed stuff if the same shall be found to be substantially equivalent to the statement of analysis made by the manufacturers or importers.

Section 8. Each manufacturer, importer, agent or seller of any concentrated commercial feeding stuffs shall pay annually, during the month of December, to the Treasurer of the State of Illinois a license fee of twenty-five dollars (\$25.00) for each and every brand sold or offered for sale. Whenever a manufacturer, importer, agent or seller of concentrated commercial feeding stuffs desires at any time to sell such material and has not paid the license fee therefor in the preceding month of December, as required by this section, he shall pay the license fee prescribed herein before making any such sale. Said Treasurer shall in each case at once certify to the State Food Commissioner the payment of such license fee. Each manufacturer, importer or person who has complied with the provisions of this article shall be entitled to receive a certificate from the State Food Commissioner setting forth said facts. The license fees received by the State Treas-



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urer pursuant to the provisions of this section shall constitute a special fund from which to defray the expenses incurred in making the inspections and the analyses required by this Act, and enforcing the provisions thereof, and he shall report annually the amount received and the expense incurred for salaries, laboratory expenses, chemical supplies, traveling expenses, printing and other necessary matters. Whenever the manufacturer, importer or shipper of concentrated commercial feeding stuffs shall have filed the statement required by Section 1 of this Act and paid the license fee as prescribed in this section, no agent or seller of such manufacturer, importer or shipper shall be required to file such statement or pay such fee.

Section 9. This Act shall not affect persons manufacturing, importing or purchasing feed stuffs for their own use and not to sell in this State.

Section 10. The term "importer," for all the purposes of this Act, shall be taken to include all who procure or sell concentrated commercial feed stuffs.

Section 11. When the rendition of a judgment imposes a fine as provided in any of the sections of this Act, it shall be the duty of the justice of the peace or other court rendering such judgment also to render a judgment for costs, and such justice of the peace or other court shall forthwith issue a capias or warrant of commitment against the body of the defendant commanding that unless the said fine and costs be forthwith paid, the defendant shall be committed to the jail of the county, and the constable or other officer to whose hands said capias or warrant shall come, shall in default of such payment arrest the defendant and commit him to the jail of the county, there to remain as provided by Section 171 of "An Act to revise the law in relation to criminal jurisprudence," in force July 1, 1895, unless such fine and costs shall sooner be paid.

Section 12. All Acts and parts of Acts inconsistent with this Act, be and they are hereby repealed.

THE SILO.

There is no more important question before dairymen today than that of the silo and ensilage. It means an abundant supply of feed for cows, the feed not only being of the best but representing the smallest cost. The silo means economy of production, absolute protection against a shortage of feed, convenience and, in fact, profit on good cows regardless of weather.

An important bulletin on The Iowa Silo has been issued recently from the Iowa Experiment Station. This bulletin not only describes the Iowa silo and details its construction, giving results of experiments carried on by the station with this silo, but gives much other information.

Essentials of a Good Silo.

Under this heading the bulletin has the following:

"The fundamental principle involved in preservation of silage is the retention of moisture within the silage and the exclusion of air. For this reason, the silo wall must be non-porous. Moisture must be prevented from passing out and air from passing in.

Rigidity, Strength and Smoothness of Walls.

"An ideal silo must have rigid walls. It must be strong enough to resist the bursting pressure of the silage. This acts outward in all directions as the silage settles. The friction of the silage against the wall, and the weight of the wall produce a crushing action which is great near the bottom of the silo. A silo when empty should be heavy enough to stand against heavy winds. The inside of a silo wall should be reasonably smooth to permit the silage to settle freely. If the wall is not smooth or if there are shoulders or offsets on the inside surface, air pockets will be formed and a considerable loss of silage will result.

Durability.

"After due consideration to all other points of merit to be found in silos, the most desirable silo is the one that is the most durable and will give the longest term of service. The durability of a silo depends, first upon its strength, and second, the durability of the material used in its construction.

"To be durable, any material must resist the action of the weather, the constant wetting and drying, freezing and thawing in the winter season, and any disintegrating action which may be due to the silage itself. Some material will disintegrate with age, and other materials suffer from rapid decay when subject to the warm, moist conditions which exist in the silo.

Care and Repair.

"It is desirable that a silo require the minimum expenditure in the way of labor and material for its up-keep. A silo which must be adjusted for shrinkage and expansion is of less value than one which does not need such attention. Often this work is neglected, and loss results.

"Some silos must be frequently repainted in order to present a pleasing appearance. This means added expense. All parts should be equally durable and lasting. The replacement of parts which are short-lived, the substitution of new pieces for those which have become decayed or faulty for any other reason, adds materially in many cases to the cost of maintaining the silo.

Frost Resistance.

"In Iowa the winters are so severe that it is difficult to construct a frost-proof silo. The silo wall which will prevent freezing to the greatest extent is the most desirable.

Convenience.

"A silo should be convenient for filling and so arranged that the silage may be easily removed from day to day during the feeding season. The doors should be so constructed that they

can be put in place and removed with the least effort. They should permit easy access to the silo and allow the removal of the silage with the least possible amount of labor.

Portability.

"There are instances where tenants and others desire a silo which may be used in one place for a time and then moved to a new location. Under such circumstances, this feature should be given due consideration.

Fire-Proof Construction.

"It adds materially to the value of any building to be made of fire-proof material. The importance of this feature is realized when the large annual loss from fire is taken into consideration.

Appearance.

"All farm buildings should be of good appearance. This feature adds both to the attractiveness and the value of the farm. A permanent silo of neat appearance is the most desirable silo to construct, other things being equal.

Simplicity of Construction.

"It is an advantage to select a silo which can either be constructed without special skilled labor, forms or tools, or can be purchased ready for erection without the aid of skilled labor.

Cost.

"One of the most important features to be considered in the selection of a silo is its first cost. The silo which will furnish storage for silage at the least cost per ton is the silo to build, other points being equal."

The Iowa Silo.

A discussion of the Iowa silo under each of the points of merit which have been mentioned follows:

Imperviousness of the Walls.

Hard burned hollow clay building blocks will not absorb a large amount of water. Moisture is not readily transferred through a wall of such material. We recommend that only blocks which have a low absorption be used for silo construction. Blocks of this kind are more durable, and a silo built of them will preserve silage better.

The mortar used in laying the blocks should be a rich, water-tight mixture. This will resist the passage of moisture or air through the joints. To secure a more perfect wall, it is recommended that the inside be washed with cement. This will seal any minute openings or imperfections.

A careful personal inspection has been made of the silage in the thirteen Iowa silos which have been built up to the time of writing and, with one unimportant exception, the silage was found in first-class condition throughout the entire feeding season. There is no reason why the walls of the Iowa silo should not be entirely satisfactory for the preservation of silage. That they are satisfactory has been demonstrated by actual test..

Rigidity, Strength and Smoothness of Walls.

The outward or bursting pressure of silage has been found by previous experiment to amount to about 11 pounds per cubic foot. To be well designed, any silo must be constructed of material of sufficient strength to resist this pressure. Square silos are not well adapted to resist this bursting pressure on account of their flat sides. They are almost sure to bulge. For this reason the round silo is the most desirable form.

The silo, owing to its diameter and height, offers a rather large amount of surface upon which the force of the wind may act. For this reason the silo walls should be of rigid construction and not readily distorted or damaged by high winds. Furthermore, it is best that the structure should be heavy enough when empty to resist being moved readily from its foundation by strong winds. Some types are so light that they must be thoroughly

tied to adjacent buildings and held to place by guy wires. The importance of this feature is emphasized through the fact that certain insurance companies do not care to insure such types of silos and either will not insure at all or only when extra charge is made for exposure. The Iowa silo is rigid enough and heavy enough so that it is not affected by wind.

Enough steel reinforcement is laid in the mortar joints of the Iowa silo to carry the entire bursting pressure of the silage with a reasonable factor of safety. Originally, the safe working load of the steel was taken at 20,000 pounds per square inch, which gives a factor of safety of three for steel rolled in relatively large bars. As it has been found that steel wire is the most desirable reinforcement, the safe working strength has been raised to 30,000 pounds per square inch. The drawing process through which wire must pass in its manufacturing increases its tensile strength and this change on the part of the designers is entirely justified as there is no reduction in the strength of the reinforcement. As originally designed, practically as much steel was included in the walls of the Iowa silo as was to be found in the hoops of the average stave silo which not only must resist the bursting pressure of the silage, but the swelling action of the staves. The form of reinforcement which has been found the most convenient for the Iowa silo is hard black, No. 3 steel wire which is laid in the mortar joints as described later.

Some silo walls have been known to crumple at the bottom, due to the weight of the walls themselves and to the friction of the silage. The 4-inch block wall of a 16-foot Iowa silo, 35 feet high, will carry not only its own weight at the bottom, but that of all the silage which could be placed in the silo several times over.

When constructed of curved blocks, the Iowa silo has been made reasonably smooth on the inside, there has been no loss of silage from the roughness of the wall. Silo No. 1, which was constructed of 16-inch blocks with little curvature, permitted a few air pockets to form, resulting in a small amount of spoiled silage after being stored in the silo for two years.

Durability.

• The walls of the Iowa silo are constructed of hollow, vitrified clay building blocks, which as far as weather resistance is concerned, are as durable as any building material which can be obtained. Their durability corresponds with the durability of brick which is to be found in all parts of the State. This does not mean that all hollow building blocks are durable, for there are good and bad blocks on the market. Good blocks are so plentiful that no one need make the mistake of selecting blocks of questionable merit. A discussion of the quality of blocks is given later.

The roof of the Iowa silo, like the walls, is made of durable material. A cheaper roof may be used if desired, but it is strongly advised that the concrete roof be used where possible.

One common mistake met with in silo construction is that the door frame is made of material which will soon decay or rust and have to be replaced. The door frame of the Iowa silo is made of reinforced concrete which, when properly constructed, should be as durable as the walls themselves.

The materials used in the Iowa silo will resist decay, disintegration, the action of frost, and any implied or real action of the acidity of the silage. Even the steel which is placed in the mortar joints and concrete door frame as reinforcement, is thoroughly protected from rust. So carefully has the matter of durability been considered in the design of the Iowa silo that it would be difficult to estimate its life. When carefully built it ought to last for several generations.

The doors of the Iowa silo are designed to be made of wood. They will decay and must be replaced after several years. The convenience and low cost of the wooden doors, which may be easily replaced, justifies their use.

Care and Repair.

The Iowa silo when properly constructed is practically free from any expense for repair and maintenance. The only pos-

sible expense may be the occasional washing of the inside of the walls at intervals of not less than five years, with a cement wash and the replacement of the doors after they have become rotten from use.

Frost Resistance.

Owing to the fact that all Iowa silos do not now have roofs and that no two men use the same methods in feeding silage, it has been difficult for the authors to compare the frost resistance of different types of silos. It is, however, a very conservative statement to say that the average amount of frozen silage found in the Iowa silos during personal inspection trips did not exceed the amount found in wooden silos in the same neighborhood and under the same conditions of exposure.

The hollow wall of the Iowa silo in which the circulation of air is quite thoroughly restricted, tends to make it frost resistant. Dry fir lumber is about six times as efficient a non-conductor of heat as vitrified clay. Since the Iowa silo wall is twice as thick as the average silo stave, and because it is only about one-fourth solid, it should be at least equally as efficient as a two-inch wooden wall which is always moist, a condition which lowers the efficiency of wood as a non-conductor. The Iowa silo wall, however, is not nearly as frost proof as a double wall concrete silo or cement block silo with less material joining the two walls and with restricted air circulation.

Convenience.

The Iowa silo has been designed and constructed with either individual or continuous doors. The continuous doorway has cross-ties 42 inches apart which is an important advantage over the usual construction which in some instances has hoops or ties as close as 26 inches. When cross-ties are close, the continuous door offers but little advantage if any over the individual door. With these improved doors, the Iowa silo offers as many advantages for convenience in removing silage as any construction now known.

The concrete roof of the Iowa silo has a wide, flat gutter in which it is possible to stand while adjusting the blower pipe of an ensilage cutter to the silo for filling. This is a valuable convenience compared with the usual steep roof upon which it is impossible to stand, requiring that the work of adjusting the blower pipe be done from the window or a ladder.

Portability.

In no sense can the Iowa silo be considered portable. If a silo is desired which must be moved to a new location after a few years, it is doubtful if the Iowa silo would fill the requirements. The roof and door frame would be entirely destroyed in moving and it would be worth nearly as much as the value of the blocks to clean them for use the second time.

Fire Proof Qualities.

The Iowa silo is perfectly fire-proof. It is hard to see how it could be even slightly damaged by a fire. In general, fire-proof construction is given too little attention. One of the authors of this bulletin visited a masonry silo from which silage was fed within twenty-four hours after all the adjoining buildings had been burned from around it, leaving it unharmed and containing the only feed stuff saved from the fire. Hollow, vitrified clay building blocks are widely used for fireproofing purposes.

Appearance.

The Iowa silo presents a pleasing appearance of solidity, durability and permanency.

Simplicity of Construction.

The concrete silo upon investigation has been found to be a satisfactory silo when carefully built. Its construction, however, is so difficult that very few really good silos have been found which have not been constructed by the professional silo builder. The manipulation and construction of the forms for building a

concrete silo are so difficult that although a silo may be satisfactory as far as strength and keeping qualities are concerned, the walls are often rough, distorted and not of good appearance. Good forms for the concrete wall are expensive and considerable equipment is necessary to handle the concrete.

The walls of the Iowa silo are of a construction familiar to all masons and for this reason a satisfactory job is practically assured. The reinforcement of the walls with the steel laid in the mortar joints is a very simple matter.

The forms for making the reinforced concrete doorways, although of much the same character as those required for making a concrete silo wall, are much more easily handled and are quite simple. The scaffold for building the silo has been carefully worked out. The roof construction is simple and should not give anyone trouble who is familiar with concrete work in any form.

Cost.

An attempt has been made to determine accurately the cost of the original thirteen Iowa silos. A definite statement is hard to get, since in almost every instance the farm force assisted to a more or less extent, introducing items of labor, haulage, etc., difficult to estimate. The owners in most instances prefer not to take these items into account, yet in making a complete statement, they must be included.

Silo No. 1, owing to the fact that it was an experimental silo and that some of the material was secured at a cost below normal, is not listed here.

Silo No. 2 was built under normal conditions but certain experiments increased its cost to some extent over the next silo which was built. The development of certain features of construction, especially the scaffold, was a large factor in reducing the cost of those constructed later.

Following is a statement of the cost of silo No. 2, which is located at Linn Grove, Iowa.

Size 16 feet in diameter by 35 feet high.

Excavation $3\frac{1}{2}$ feet deep—

Labor of superintendent, 15 hrs. at 50c.....	\$ 7.50	\$ 7.50
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Footing and Floor—

Labor of superintendent, 9 hrs. at 50c	4.50	
Labor of mason, $9\frac{1}{2}$ hrs. at 40c.....	3.80	
Labor of mason's helper, $9\frac{1}{2}$ hrs. at 30c.....	2.85	
56 ft. discarded 36-inch woven wire fence.....		
52 ft. 4-inch drain tile	1.68	
14 sacks cement at 45c	6.30	
4 yds. of gravel at 25c	1.00	20.13

Wall and Door Frame—

Labor of superintendent, 65 1-3 hrs. at 50c.....	32.67	
Mason, $66\frac{1}{4}$ hrs. at 40c	26.50	
Helper 66 hrs. at 30c	19.80	
Unskilled labor, 173 hrs. at 15c	25.95	
Blocks, 4,000 4x5x12½ at \$17.50 per M.....	70.00	
Freight	19.42	
Cement, 38 sacks at 45c	17.10	
Lime, 18 sacks at 30c	5.40	
400 lbs. No. 3 wire at 3c	12.00	
75 lbs. $\frac{3}{8}$ steel, \$1.31, cartage and freight 60c.....	1.91	
Sand, 4 yards at 50c	2.00	
Additional wire	3.87	236.62

Moving scaffold (old material used)—

Labor of superintendent, 19 hrs. at 50c	9.50	
Labor of mason, 16 hrs. at 40c	6.40	
Labor of helper, 14 hrs. at 30c	4.20	
Labor of unskilled, 9 hrs. at 15c	1.35	
Stirrups	7.50	28.95

Roof—

Making cornice blocks—

Labor of superintendent, 19 hrs. at 50c	9.50
Cement, 6 sacks at 45c	2.70
Sand, 2-3 yard at 50c	.33
10 lbs. No. 9 wire at 3c	.30

Setting cornice blocks—

Labor of superintendent, 13 hrs. at 50c	6.50
Labor of mason, 13 hrs. at 40c	5.20
Labor of unskilled, 17 hrs. at 15c	2.55
1 sack of cement at 45c	.45c
Wire for tying down	.20

Framing false work—

Carpenter, 5 hrs. at 30c	1.50
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Setting false work—

Superintendent, 4 hrs. at 50c	2.00
Mason, 4 hrs. at 40c	1.60
Helper, 4 hrs. at 30c	1.20

Concrete—

Cement, 18 sacks at 45c	8.10
Gravel, 3 cu. yards at 25c	.75

Placing expanded metal—

Mason's helper, 13 hrs. at 30c	3.90
Expanded metal	15.80
Freight	2.32
Lumber of roof falsework, 124 ft. lumber at \$30 per M	3.72

Labor of putting on concrete—

Superintendent, 7 hrs. at 50c	3.50
Mason, 7 hrs. at 40c	2.80
Helper, 7 hrs. at 30c	2.10
Unskilled labor, 10 2-3 hrs. at 15c	1.60

Plastering roof and removing falsework—

1-3 yd. sand at 50c	.17
3 sacks of cement at 45c	1.35
1½ sacks lime at 30c	.45
Labor, mason, 10 hrs. at 40c	4.00
Labor, helper, 10 hrs. at 30c	3.00

87.59

Lumber for door forms, 110 ft. at \$30 per M.....	3.30	
Labor of making, superintendent, 15 hrs. at 50c.....	7.50	10.80
Lumber for doors, 150 ft. at \$35 per M.....	5.25	
Labor of making, carpenter, 3 hrs. at 30c.....	.90	6.15
		\$390.99

This statement is much lower than that furnished by the owner, which is as follows:

Steel	\$ 1.56
Freight	.35
Wire for eaves	.50
Moulding	.15
Bolts	.40
Black wire	.50
Pipe	.15
No. 3 wire	12.00
Blacksmith	7.75
Common tile	1.68
Vitrified blocks and freight	89.42
Steel for roof	15.80
Freight for same	2.32
Telephone wire	3.87
80 sacks cement at 45c per sack	36.00
6 loads of sand	1.50
5 loads of gravel	1.25
2 2-3 bbls. lime	3.90
Labor	30.00
Mason work	92.00
Carpenter work	4.50
Boy labor	2.50
Total	\$308.10

The latter statement represents accurately the actual cost outlay of the owner for the silo.

Cost of Iowa Silo No. 3 at Rock Valley, Iowa.

Size, 16x35 feet, inside.

Excavation 3½ ft. deep—

Labor of excavating and placing footing by contract..	\$ 10.00	
Cement, 2½ bbls. at \$1.60	4.00	
Gravel, 2 cu. yds. at \$2.00 delivered	4.00	\$ 18.00

Wall and door frame—

Labor of superintendent, 84 hrs. at 50c	42.00	
Mason, 71 hrs. at 40c	28.40	
Labor, 179 hrs. at 20c	35.80	
Blocks, 4x5x12, 4,000 at \$17.50 per M.....	70.00	
Freight	20.88	
Hauling blocks	9.60	
Cement, 7 bbls. at \$1.60	11.20	
Lime, 3 bbls. at \$1.50	4.50	
Steel wire, 450 lbs. at \$2.37½	10.69	
Steel, ¾-inch, 75 lbs., \$1.31, cartage and freight 60c..	1.91	
Sand, 4 yds. at \$2.25	9.00	243.98

Scaffold—

Labor, superintendent, 19 hrs. at 50c	9.50	
Labor, unskilled, 16 hrs. at 25c	4.00	13.50

Material—

5 pcs. 2x8x12.		
2 pcs. 2x10x16.		
4 pcs. 2x4x6.		
6 pcs. 2x12x14.		
8 pcs. 2x6x16.		
20 pcs. 1x6x16—605 ft. at 30c	18.15	
8 pins ¾x16 inches	.50	
4 wire stretchers at 75c	3.00	
3 lbs. spikes, 16d	.10	35.25

Roof—

Making cornice blocks—

Labor of superintendent, 10 hrs. at 50c	5.00
Unskilled labor, 15 hrs. at 25c	3.75
Cement, 5½ sacks at 45c	2.48
Sand 2-3 yds. at \$2.25	1.50
Steel reinforcement 6 lbs. at 3c	.18

Setting blocks—

Labor, superintendent, 4 hrs. at 50c	2.00
Labor, mason, 4 hrs. at 40c	1.60
Unskilled labor, 12 hrs. at 25c	3.00
1 sack cement	.45
Wire for tying down	.30

Framing false work—

Carpenter, 4 hrs. at 30c	1.20
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Setting—

Superintendent, 2½ hrs. at 50c	1.25
Mason, 2½ hrs. at 40c	1.00
Carpenter, 2 hrs. at 30c	.60
Expanded metal, \$16.00 and \$4.86.....	20.86

Placing expanded metal—

Superintendent, 4 hrs. at 50c	2.00
Mason, 4 hrs. at 40c	1.60
Unskilled labor, 4 hrs. at 25c	1.00
Lumber for false work, 124 ft. lumber at \$30 per M....	3.72
Cement, 20 sacks at 45c	9.00
Gravel, 2 yds. at \$2.25	4.50

Labor of putting on concrete—

Superintendent, 8 hrs. at 50c	4.00
Mason, 8 hrs. at 40c	3.20
Unskilled labor, 21 hrs. at 25c	5.25

Removing false work and scaffold—

Mason, 4 hrs. at 40c	1.60
Helper, 4 hrs. at 30c	1.20

Plastering—

Mason, 5 hrs. at 40c	2.00	
Helper, 5 hrs. at 30c	1.50	
Cement, 3 sacks at 45c	1.35	
Lime, 1½ sacks at 30c	.45	87.54

Lumber and bolts for door forms—

Material—

110 ft. at \$30.00	3.30	
12 bolts	1.00	
2 lbs. nails, 7d.....	.06	4.36

Derrick—

1 pc. 2x10x18.		
1 pc. 2x6x16.		
1 pc. 2x4x10.		
2 pcs. 1x6x16—63 ft. at 30c	1.80	1.80

Doors—

Lumber, 272 ft. at 35c	9.52	
Labor, 10 hrs .at 30c	3.00	12.52

\$403.45

The owner of this silo states that, according to his accounts, this silo cost, without the chute, about \$325 to \$350.

The Location of the Silo.

A very large percentage of the silos used in Iowa are located outside of the barn. There are good reasons for this. First, the Iowa silo is of such a construction that it does not need the protection of a building. Second, it is not economical to place a silo in a building where it will occupy space which may be put to other use. Third, a silo located inside of a building is often unhandy to fill. The forage cannot be delivered to the cutter conveniently. Fourth, by locating a silo outside of the building and only connecting it thereto with a passage provided with doors, the objectionable odor of the silage may be kept out of the building. By arranging the silo so as to be connected to the

feeding room with a feed way, it is as convenient for feeding as when located in the building itself. A very common arrangement is to so locate the silo that the passageway from silo to barn is a continuation of the feed way in the barn. In general, it seems that there are few advantages in building a silo inside of a building and many in building it outside. There are types of barns, the large round barn for instance, which are of a form making it possible for a silo to be conveniently located at the center.

Foundation.

Any building should rest upon a foundation sufficiently broad to prevent appreciable settling, and deep enough to rest upon soil which is never disturbed by frost. In the case of a masonry silo the foundation may be advantageously a continuation of the wall. If the space enclosed within the foundation be excavated, it becomes available for the storage of silage. This space, however, costs a little more than the space in other parts of the silo on account of the additional labor of excavation. Thus, it will be seen that it is not economical to extend the foundation deeper than necessary to get below frost. For the Iowa, a good depth of pit is three and one-half feet.

Drainage of Foundation.

In case there is a probability of ground water standing about the foundation, there should be a tile drain placed. Porous back filling placed outside the foundation insures that any surface or ground water will sink to the drain rather than fill the blocks of the wall through any crevice which may exist.

There are at least four different types of foundations, one of which will be applicable to any conditions which may arise. The different types are as follows:

1. Building blocks throughout.
2. Concrete footing with blocks extending from the floor up.

3. Concrete footing with blocks laid on end and filled with concrete.

4. Concrete footing and foundation extending to about one foot above the grade line.

No. 1 type of foundation. The first course of footing is 16 inches wide, made of two eight-inch blocks laid flatwise side by side. Then the next course, 12 inches in width, should consist of blocks laid flat crosswise and bedded in mortar. This completes the footing and the third course becomes the first course of the wall. The third and each succeeding course should be liberally mortared or plastered at the outside of the vertical joint. This reduces the liability of water getting into any course of the foundation. The lower course if connected to a drain would render any other drainage unnecessary.

No. 2 type of foundation. This form of foundation simply consists of a concrete footing which is placed in a trench at the bottom of the pit, 12 inches or one spade deep, 8 inches or one spade wide at the top, flared to 16 inches in width at the bottom. On the top of this footing is placed the wall built of blocks.

These two types of foundation are often advisable because a form is not required for building them. Choice between Nos. 1 and 2 would depend entirely upon their relative cost. In communities where sand and gravel are expensive, No. 1 would be cheaper.

Perhaps the greatest objection that can be foreseen to these two forms of foundation is the possibility of the blocks of the wall filling with water, which through carelessness or faulty drainage might be standing against the wall. In case water stands against the wall, it would in time seep through the faulty mortar joints into the air space of the wall, where it might do damage by freezing.

In order to prevent any such trouble, the outer joints may be left open at a point directly under the roof down spout, at which point there should of course be special provisions for carrying away all surface water which may collect. This may be easily accomplished by filling over an opening in the drain tile with

coarse material, which will always permit the passage of surface water directly and quickly to the drain.

No. 3 type of foundation. This type is built with a concrete footing upon which blocks are placed on end, each course being filled with concrete as it is placed and another course placed and filled in a similar manner. This method is continued to a point at least a foot above the grade line. From this point up, the blocks are laid horizontally. The advantage of this type is that the possible danger from water is obviated. More expense and work is incurred, although no material for forms is necessary.

No. 4 type of foundation. Earth is utilized for the outer form but lumber is used for the inner. By permitting this to extend down only to within a few inches of the bottom of the pit, the footing may be permitted to widen. This is desirable as a wall need never be as thick as the width of the footing. In case the ground is reasonably level and firm, it will be cheaper to simply dig a narrow trench and widen same at bottom to 16 inches. If ground is excavated next day and concrete trimmed, a reasonably smooth job is insured.

The Floor.

Under certain conditions, the silo floor may be dispensed with without interfering with the preservation of the silage. Where the silo rests upon dry clay or any nonporous soil, and where the foundation is deep enough to prevent undermining by rats, the floor may be omitted. Usually, however, a floor is desirable. The portion of the silo below the ground may be made more nearly water tight, the floor may be thoroughly cleaned, and there is no mixing of earth with the silage. A silo floor need not be thick or expensive, as the weight of the silage, though very great, is evenly distributed over the surface and would be just as firmly supported if the floor was not used. A concrete floor of the usual sidewalk construction, three to four inches in thickness, will be very satisfactory. If properly graded sand and

gravel can be obtained, one part of cement to five parts of sand and gravel will be about the right proportion to use. The concrete should be thoroughly tamped and troweled.

In some cases where sand and gravel are expensive, it may be cheaper to use clay sidewalk block or even a hollow block, the same as used in the wall, covered with a thin coat of plaster. In the case of the sidewalk blocks, the plastering covering would be unnecessary if the blocks were laid in cement. The floor should be slightly hollowed in the center as a matter of economy and convenience.

The Silo Wall.

The first consideration in the wall is the selection of the material. The material used in the Iowa silo as originally designed was rectangular, hollow, clay building blocks, such as have been commonly used extensively in important buildings for years. It was originally designed with a plaster coat of cement mortar both inside and outside. However, the experimental silo was not plastered either inside or out but simply washed on the inside with a cement wash and, for the time it has been used, it has been entirely satisfactory, indicating that the plastering is not necessary where a tile block is used which will resist the weather. In fact, only two of the silos in the bulletin have been plastered. It is to be noted that the durability of this silo will depend directly upon the quality of the blocks. Soft blocks which have not been properly burned should be guarded against. On the other hand, good vitrified blocks are among the most reliable and durable of all building materials.

It would be difficult to overestimate the advantages of curved blocks. The only spoiled silage found near the walls of silo No. 1 was a slight amount not exceeding one to four cubic feet or .01 to .06 of one per cent of the total amount. This spoiled silage was found in the recesses of the wall, which was quite rough due to the use of long 16-inch straight blocks. A workman lays up the curved block more rapidly, and with more satis-

faction than the straight block. The wall is smoother inside and out which is of obvious advantage to the preservation of silage inside and the appearance outside.*

*The curving of these blocks is not so difficult that any manufacturer should hesitate in doing it. The authors make no pretense of being clay-workers, but have personally helped to arrange a cutting table to bend these blocks automatically. An outlay of a few dollars is sufficient to equip an ordinary cutting table for this bending. Then no other extra labor is necessary as the ends need not be cut radial and they will fit concave to convex sides, thus little difficulty will be found in setting them in the kiln.

The Roof.

Reinforcing walls, the construction of doors, the manner of doing the work of building and all the details are given in the bulletin. The general remarks about the roof are as follows:

Perhaps the greatest advantage of a roof is the lessened liability of the silage freezing. Not only is it impossible to prevent freezing in severe weather unless the silo is provided with a roof, but during snowy or rainy weather the silage is mixed with snow or wet down with rain. Furthermore, a silo without a roof becomes a catching place for husks, dust or anything carried in the wind and a favorite feeding ground for the neighborhood pigeons and birds. Although many silos are not provided with roofs and the live stock eagerly eat the silage from them, it is evident that a roof would not only reduce the amount of frozen silage, actually save silage and preserve its quality, but be worth its cost in making a more pleasant place to feed from in bad weather. The roof is also valuable in adding to the silo's appearance. A door for filling, large enough to admit the carrier or elevator from the ensilage cutter, should be placed in the roof. Some light should be admitted to the silo for if not it will be necessary to use a lantern when removing the silage. It is advisable to have all portions of a building as near equally durable as possible, therefore, concrete roofs have been built on

several, and a convenient method of construction has been developed for the same. In case a wooden roof or any other kind of a roof is desired, a plate made up of two thicknesses of 1-inch lumber sawed to the proper curvature may be bolted down to the upper course of blocks.

One of the first considerations is the pitch of the roof. The first Iowa silo built was covered with a $\frac{1}{4}$ pitch roof. This gave only four feet of head room under the roof at the center for a man to work when finishing the filling of the silo. Roofs put on with a 1-3 pitch seem considerably more satisfactory both in outward appearance and in the amount of head room secured beneath.

Creameries, Cheese Factories, Milk Condensing Plants and Milk Bottling Plants.

Prepared by Illinois State Food Commission.

LIST OF CREAMERIES AND CHEESE FACTORIES.

ADAMS COUNTY.

Name of Creamery.	Postoffice.	Manager.
Camp Point Creamery Co.....	Camp Point.....	W. A. Catl.....
Columbus Creamery Associa'n	Columbus	B. Allen.....
Ursa Creamery Association...	Ursa	J. F. Ruddell.....
Golden Creamery Co.....	Golden	H. H. Frangen.....
Liberty Creamery.....	Camp Point .....	.....
Pioneer Creamery Co.....	Camp Point	L. Nielson.....
Mendon Sep. Sta.....	Mendon .....	.....
Liberty Creamery.....	Liberty .....	.....

ALEXANDER COUNTY.

Name of Creamery.	Postoffice.	Manager.
Cairo Creamery Co.....	Cairo .....	.....

BOND COUNTY.

Name of Creamery.	Postoffice.	Manager.
Sorento Creamery.....	Sorento .....	.....
Reno Equity Exchange.....	Reno .....	.....
Helvetia Cond. Co.....	Helvetia	Wm. Kaeser.....
Greenville Creamery Co.....	Greenville .....	.....
Mulberry Grove Creamery....	Mulberry Grove .....	.....

BOONE COUNTY.

Name of Creamery.	Postoffice.	Manager.
American Milk Prod. Co.....	Capron	Anderson & Chellgren..
Bloods Point Creamery.....	Belvidere	C. M. Wait.....
Belvidere Creamery.....	..do	Geo. Reed.....
Schattuck Grove Creamery.....	..do	Cornell Bros.....
Garden Prairie Creamery.....	Garden Prairie	L. Jacobson.....
Nora Creamery.....	Clinton, Wis., R. F. D...	A. J. Olson & C.H. Patton
Capron Creamery.....	Capron	H. W. Carmichael.....
Caledonia Creamery.....	Caledonia	C. M. Wait.....
Poplar Grove Creamery.....	Poplar Grove	C. J. Stesbuger.....
American Milk Prod. Co.....	Sharon, Wis .....	.....
Borden's Condensed Milk Co..	Belvidere .....	.....
Bowman Dairy Co.....	Poplar Grove .....	.....
Irene Creamery.....	Irene .....	.....
Bennett Creamery.....	Belvidere .....	.....
American Milk Prod. Co.....	Garden Prairie .....	.....

BUREAU COUNTY.

Name of Creamery.	Postoffice.	Manager.
New Bedford Creamery.....	New Bedford .....	.....
P. C. Bacon.....	Tiskilwa .....	.....
J. R. Biddolph.....	Tiskilwa .....	.....
L. L. Main.....	..do .....	.....
Tiskilwa Cheese Factory.....	..do .....	.....
Providence Cheese Factory...	Providence .....	.....
E. H. Waddell.....	Princeton .....	.....
Wood & Shugart.....	..do .....	.....
Metamora Creamery Co.....	Metamora .....	.....

CARROLL COUNTY.

Name of Creamery.	Postoffice.	Manager.
Fairhaven Creamery Co.....	Fairhaven .....	.....
Savanna Creamery.....	Savanna	H. Pierce.....
Lanark Creamery.....	Lanark	John Newman Co.....
Nursery Creamery.....	..do	..do
Mt. Carroll Creamery.....	Mt. Carroll	..do
York Creamery.....	..do	B. Carpenter.....
Wacker Creamery.....	Wacker	Melendy & Hicks.....
Shannon Creamery.....	Shannon	J. P. Younger.....
Keltner Creamery.....	Keltner	Wm. Keltner.....
Bluff Springs Creamery.....	Thomson	G. M. Melendy.....
Chadwick Creamery.....	Chadwick	Melendy & Hicks.....
Milledgeville Creamery.....	Milledgeville	John Newman Co.....
Deer Creek Creamery.....	Wacker .....	.....
Savanna Produce Co.....	Savanna .....	.....
Riverside Cheese Co.....	Mt. Carroll .....	.....
H. S. Betts.....	..do .....	.....
E. C. Dodge & Co.....	Savanna .....	.....
Pierce's Creamery.....	..do	H. Pierce.....

CHAMPAIGN COUNTY.

Name of Creamery.	Postoffice.	Manager.
University of Illinois.....	Champaign .....	.....
St. Joseph Creamery.....	St. Joseph .....	.....

CHRISTIAN COUNTY.

Name of Creamery.	Postoffice.	Manager.
Lilly of the Valley Creamery..	Pana	E. S. DuBunn.....
Xenia Creamery.....	Xenia	T. W. Ketley.....
Flora Creamery.....	Flora	J. B. Newberry.....
Louisville Creamery.....	Louisville	C. H. Campbell.....
Owaneco Creamery.....	Owaneco .....	.....
Rural Township Creamery....	Pana .....	.....
Taylorville Creamery.....	Taylorville .....	.....

CLARK COUNTY.

Name of Creamery.	Postoffice.	Manager.
Marshall Milk Co.....	Marshall	R. M. Smith.....
Martinsville Creamery.....	Martinsville	C. G. Wilson.....
Wabash Valley Creamery....	West Union	E. A. Snider.....

CLAY COUNTY.

Name of Creamery.	Postoffice.	Manager.
Wabash Creamery.....	Clay City .....	.....
Ebner Ice & Storage Co.....	Flora .....	.....
Damiansville Creamery.....	Louisville .....	.....
Flora Creamery.....	Flora	M. H. Simpson.....
Clay City Creamery.....	Clay City .....	.....

CLINTON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Germantown Creamery.....	Germantown	G. Gensenhaus.....
Union Dairy.....	Bartelso	H. Gramame.....
Breese Creamery.....	Breese	J. H. Schurman.....
Damiansville Creamery.....	Damiansville	H. Fuehne.....
Albers Creamery.....	Albers	T. Radeanicher.....
Hoffman's Milk Depot.....	Hoffman	W. Hussman.....
Carlyle Milk Station.....	Carlyle	J. J. Gray.....
Shattuc Milk Depot.....	Shattuc	H. Wiedle.....
Grapeman Milk Co.....	Trenton	W. Grapeman.....
St. Rose Creamery Co.....	St. Rose .....	.....
Trenton Creamery Co.....	Trenton	H. Kruep.....

COOK COUNTY.

Name of Creamery.	Postoffice.	Manager.
M. Richmond.....	Palatine .....	.....
So. Barrington Creamery.....	Barrington .....	.....
Arlington Heights Creamery..	Arlington Heights	E. J. Scharringhausen..
Buffalo Grove Creamery.....	Buffalo Grove	J. P. Weidner.....
Sigwalt Creamery.....	Arlington Heights R. R.	J. A. Sigwalt.....
Highland Grove Creamery....	Palatine	H. L. Scharringhausen..
Spring Creek Creamery.....	Barrington	A. H. Bohmaer.....
So. Barrington Creamery.....	do	do
Deike Creamery.....	Itasca	E. H. Deike
Wheeling Creamery.....	Wheeling	H. Bohmaer
Hanover Creamery.....	Elgin, R. F. D. 5.....	C. H. Volkening.....
Mewes Bros.....	So. Chicago .....	.....
Nebels Creamery.....	Roselle	F. Nebels
Townline	Bensonville	H. Grobe
Buttermilk Corner Creamery..	Barrington	Aug. Bohmaer
Union Creamery.....	Roselle	H. Derrking.....
Schammburg Creamery.....	Palatine	L. Wilkening.....
Des Plaines Creamery.....	Des Plaines	H. H. Rosen.....
Elk Grove Creamery.....	Bensonville	J. F. Everding.....
Schammburg Creamery.....	Roselle	H. C. Patton.....
Nowak Mfg. Co.....	Ontarioville .....	.....
Spencer Otis.....	Barrington .....	.....
Chas. Eckerly.....	120 Humphrey av. Oak Park .....	.....
J. B. Wagner.....	Wheeling .....	.....
Orland Creamery Co.....	Orland .....	.....
Chas. Orchard.....	Lemont .....	.....
Condensed & Bottling Plant..	Barrington	Bowman Dairy Co.....
Tanning Fluid F.....	Ontarioville .....	.....
Borden's Milk Co.....	Palatine .....	.....
Borden's Milk Co.....	Arlington Heights	A. C. Winter.....
Proviso Creamery.....	Proviso, R. F. D. ....	.....
Boehmer & Deerking.....	Schaumburg .....	.....
L. Wilkening.....	do .....	.....

COLES COUNTY.

Name of Creamery.	Postoffice.	Manager.
Lerna Creamery Co.....	Lerna	J. D. Paris.....

CRAWFORD COUNTY.

Name of Creamery.	Postoffice.	Manager.
Robinson Creamery.....	Robinson	G. E. Kesler.....
Oblong Creamery.....	Oblong	A. L. Work.....
Metamora Creamery.....	Metamora	J. L. McGuire.....

CUMBERLAND COUNTY.

Name of Creamery.	Postoffice.	Manager.
Coldwell Creamery.....	Neoga	H. W. Hawkins.....
Toledo Creamery	Toledo	R. H. Smith.....

DE KALB COUNTY.

Name of Creamery.	Postoffice.	Manager.
Borden's Condensed Milk Co..	Sycamore	Wood & Delana.....
Ohio Grove Creamery.....	Cortland	A. C. Winter.....
Crystal Creamery.....	Waterman	O. E. Murphy.....
Murphy Creamery.....	Sycamore	C. H. Gurler.....
Malta Creamery.....	Malta	Anderson & Chiefgreen..
Kingston Creamery.....	Kingston	Oatman Mfg. Co.....
Maple Park Creamery.....	Maple Park	Wood & Delana.....
Pierce Creamery.....	Hinckley, R. F. D.	..do
Cortland Creamery.....	Cortland	Beatrice Creamery.....
Shabbona Creamery.....	Shabbona	Wood & Delana.....
Denton Creamery.....	Maple Park	Richmond Bros.....
Waterman Creamery.....	Waterman	Beatrice Creamery.....
Hinckley Creamery.....	Hinckley	Palace Car Creamery...
Somonauk Creamery.....	Somonauk	J. W. Greenfield.....
Sandwich Creamery Co.....	Sandwich	I. J. Mix
Charter Grove Creamery.....	Charter Grove	C. Olson
Kirkland Creamery.....	Kirkland	F. P. Richey.....
Victor Creamery.....	Leland	Car Bros.....
Franks Creamery.....	Sandwich	I. J. Mix.....
Cold River Creamery.....	Genoa	J. Colvin.....
Colvin Park Creamery.....	Colvin Park	..do
J. N. Fuller.....	Somonauk	..do
J. Hughes.....	..do	..do
H. R. Duall.....	Sandwich	..do
C. B. Ridgley Pro. Co.....	Lee	..do
C. H. Gurler.....	DeKalb	..do
Hopkins & Hubbard.....	Hinckley	..do
South Riley Creamery Co.....	Genoa	..do
Cornell Bros.....	Maple Park	Cornell Bros.....
DeKalb Milk Depot.....	DeKalb	H. B. Gurler.....
Elva Creamery.....	Elva	Wilcox
Lee Creamery.....	Lee	..do
Belmont Creamery Association	Belmont	..do
North Virgil Creamery.....	Maple Park, R. D. 2	..do
T. Aichhabrer.....	New Lebanon	..do
E. C. Davis.....	Shabbona Grove	..do
Gurler & Hopkins.....	..do	..do
Wm. Smith.....	..do	..do
Shabbona Grove Creamery.....	..do	..do
Sycamore Creamery.....	Sycamore	..do

DE WITT COUNTY.

Name of Creamery.	Postoffice.	Manager.
Clinton Creamery Co.....	Clinton	E. Sudendorf.....
Shady Grove Creamery.....	..do	..do

DU PAGE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Roselle Creamery	Roselle	L. Wilkening.....
Lombard B. & C. Co.....	Lombard	F. Marguardt & Lombard
Cloverdale Creamery.....	Cloverdale	J. Aichholzer.....
Utopia Creamery.....	Utopia	F. Bushman.....
Naperville Creamery.....	Naperville	S. Mather.....

DU PAGE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Bloomingtondale Creamery.....	Bloomingtondale	W. Robush.....
Elmhurst Creamery.....	Elmhurst	W. Baethke.....
Bensonville Creamery.....	Bensonville	H. Grobe.....
York Center Creamery.....	Lombard	H. C. Meyer.....
Gilt Edge Creamery.....	Ithaca	H. C. Geils.....
Turner Co-op. Co.....	West Chicago	M. T. Town.....
Naperville German Creamery.	Naperville	J. Sigmund.....
Lace Creamery.....	Lace	E. J. Beathke.....
Schoumberg Creamery Co.....	Roselle .....	.....
M. A. Dooley.....	W. Chicago .....	.....
Itasca Creamery Co.....	Itasca .....	.....
Deike Creamery Co.....	Itasca	F. Stevens.....
Sweet Leaf Creamery Co.....	Lisle .....	.....
H. Wolbaum.....	do .....	.....

EDWARDS COUNTY.

Name of Creamery.	Postoffice.	Manager.
G. E. Schwarzlose.....	West Salem .....	.....
C. N. Kennard.....	Ellery .....	.....
Grayville Creamery.....	Grayville	Mrs. E. Flower.....
Clover Valley Creamery.....	West Salem	C. H. Voight.....
Jersey Creamery Co.....	Bone Gap	M. M. Fawkes.....
Brown's Cloverleaf Creamery..	Browns	F. Stevens.....
Golden Sheaf Creamery.....	Albion	J. R. Doty.....
Diamond Creamery.....	Ellery	M. McGivven.....

EFFINGHAM COUNTY.

Name of Creamery.	Postoffice.	Manager
Edgewood C. & D. Co.....	Edgewood	F. Erwin.....
Beecher Creamery.....	Beecher City	H. C. Henry.....
Star City Creamery.....	Tuetopolis	J. H. Weber.....
Dieterich Creamery.....	Dieterich	H. M. Fitcher.....
Altamont Creamery.....	Altamont	W. G. Greseking.....
Gilmore Creamery.....	Gilmore	H. Shoen.....
H. O. Henry.....	Beecher City .....	.....
Gilmore Creamery Co.....	Welton .....	.....
Wilson Bros. & Burton.....	Edgewood .....	.....
Prairie State Creamery.....	Dieterich .....	.....
Van Camp Condensery.....	Effingham	Jan Camp Cond. Milk Co

FAYETTE COUNTY.

Name of Creamery.	Postoffice.	Manager.
St. Peter Creamery Co.....	St. Peter	A. F. Brauer.....
Farina Creamery.....	Farina	I. W. Osbourn.....
St. Paul Creamery Co.....	St. Paul .....	.....
St. James Butter Co.....	St. James .....	.....

FRANKLIN COUNTY.

Name of Creamery.	Postoffice.	Manager.
E. F. Rainey.....	Thompsonville .....	.....

FULTON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Avon Creamery Co.....	Avon	N. O. Cressey.....

HANCOCK COUNTY.

Name of Creamery.	Postoffice.	Manager.
Basco Creamery.....	Basco	A. Neaglin.....
Dallas City Creamery.....	Dallas City	J. I. Heisleh.....

HENRY COUNTY.

Name of Creamery.	Postoffice.	Manager.
Colona C. Factory.....	Colona	M. J. Coleman.....
Peterson Bros.....	Galva .....	.....
W. F. Butler.....	Geneseo .....	.....
Geneseo Creamery Co.....	do .....	.....
S. A. Anderson.....	Green River .....	.....
Rickel Cheese Factory.....	Rickel	W. McNeil.....
Cambridge Creamery.....	Cambridge .....	.....
Hooppole Creamery.....	Hooppole .....	.....

IROQUOIS COUNTY.

Name of Creamery.	Postoffice.	Manager.
Iroquois Butter Co.....	Sheldon .....	.....

JACKSON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Blue Grass Creamery.....	Campbells Hill	S. L. Monteith.....

JASPER COUNTY.

Name of Creamery.	Postoffice.	Manager.
Riverside Creamery.....	St. Marie	F. L. Mercert.....
Yale Creamery.....	Yale	M. A. Dillman
Newton Creamery Co.....	Newton	

JEFFERSON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Blueford Creamery.....	Blueford	O. P. Nesmith.....
Geo. L. Newberry.....	Mt. Vernon	

JO DAVIESS COUNTY.

Name of Creamery.	Postoffice.	Manager.
Woodbine Creamery.....	Woodbine	
Menominee	Menominee	John Newman Co.....
Plum River Creamery.....	Stockton	H. R. Lyons.....
Scales Mound Creamery.....	Scales Mound	J. E. Watson.....
Hessel Bacher Creamery.....	do	J. C. Wayuer.....
Mt. Sumerick Creamery.....	Apple River	C. Porter.....
Schopville Creamery.....	Schopville	J. Brakeman.....
Apple River Creamery.....	Apple River	E. D. Hoaley.....
Warren Creamery.....	Warren	John Newman Co.....
Galena Creamery.....	Galena	do
Elizabeth Creamery.....	Elizabeth	J. Prisk.....
Stockton Creamery.....	Stockton	D. L. Mitchell.....
F. J. Dickinson.....	Elizabeth	
Elizabeth Creamery.....	do	
Millbrig Creamery.....	Millbrig	
Mitchell & Scheets.....	Apple River	
F. J. Dickinson.....	Stockton, R. F. D.....	
Willow Creamery Co.....	Stockton	
Geo. L. Wing.....	do	
Fred Arnold.....	Woodbine	
Phil Heidenrooch.....	do	
White Oak Creamery Co.....	Galena, R. F. D.....	
Dunbarton Creamery.....	Galena	
Hanover Creamery Co.....	Hanover	E. F. Hunt.....
W. D. Irwin.....	Hanover	Dittman
Mt. Hope Cheese Factory.....	Stockton	P. Gecklin.....
Devinda Cheese Factory.....	do	do
Guilford Creamery Co.....	Galena	

KANE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Fox River Butter Co.....	Aurora	C. S. Kilbourne
Hampshire Creamery.....	Hampshire	F. W. Patrick.....
North Aurora Creamery.....	North Aurora	P. Pettit.....

KANE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Kee & Chappell.....	Batavia	H. D. Conley.....
Aurora Creamery.....	Aurora	G. E. Barnes.....
Plato Center Creamery.....	Plato Center	I. J. Mix.....
Big Rock Co-op. Co.....	Big Rock	D. J. Morris.....
Sugar Grove Creamery.....	Sugar Grove	G. W. Lorah.....
North Virgil Creamery Co.....	Maple Park	G. H. Moody.....
County Line Creamery.....	Kaneville	T. P. Flanders.....
Kaneville Creamery.....	do	do
Elgin Association Creamery.....	Elgin	E. S. Davis.....
Burlington Creamery.....	Burlington	I. J. Mix.....
Oatman Condensed Milk Co.....	Dundee	J. G. Young.....
Hanover Creamery Co.....	Elgin, R. F. D.....	.....
R. H. Kamper.....	352 Plum St., Aurora.....	.....
C. H. Keinback & Co.....	Geneva .....	.....
Batavia Creamery.....	Batavia .....	.....
Borden's Condensed Milk Co.....	Hampshire .....	.....
Borden's Condensed Milk Co.....	Elgin .....	.....
Borden's Condensed Milk Co.....	Carpentersville .....	.....
Borden's Condensed Milk Co.....	Dundee .....	.....
Swanzer & Sons.....	Wasco .....	.....
St. Charles Creamery.....	St. Charles	Bowman Dairy Co.....
St. Charles Condensed Milk Co.....	do	Bordens
St. Charles Malted Milk Fact'y.....	do .....	.....
Elburn Creamery.....	Elburn	Bowman Dairy Co.....
Cornell Bros.....	Elgin .....	.....
Wm. McCredie.....	do	I. J. Mix.....
John Newman Co.....	do .....	.....
C. H. Potter.....	do	F. G. Young.....
B. S. Pearsall Co.....	do .....	.....

KANKAKEE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Momence Creamery Co.....	Momence .....	.....
Kankakee Creamery.....	Kankakee .....	.....
Holmes Creamery Co.....	Manteno .....	.....
Sollitt Creamery.....	Sollitt	C. F. Keeler.....
Manteno Creamery.....	Manteno	Anderson & Wright.....
Pure Milk & Cold Storage Co.....	Kankakee .....	.....

KENDALL COUNTY.

Name of Creamery.	Postoffice.	Manager.
Little Rock Creamery.....	Plano	O. Myers.....
Yorkville Skim Milk Station.....	Yorkville	F. Young.....
Oswego Co-op. Co.....	Oswego	M. M. James.....
Bristol Creamery.....	Bristol	F. G. Young.....
F. G. Young Cond. Milk Co.....	Yorkville .....	.....
M. I. Fries.....	Helmar .....	.....

KNOX COUNTY.

Name of Creamery.	Postoffice.	Manager.
Melan & Wetmore.....	Galesburg .....	.....

ILLINOIS STATE DAIRYMEN'S ASSOCIATION.

LAKE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Volo Creamery.....	Volo	G. H. Gurler.....
Wauconda Creamery.....	Wauconda	do
Ela Creamery.....	Prairie View	H. S. Bockelman.....
Long Grove Creamery.....	Long Grove	G. Quentin.....
West Fremont Creamery.....	Rockefeller	E. H. Meyer.....
Lake Corners Creamery.....	Lake Zurich	H. F. Schwerman.....
Lake Zurich Creamery.....	do	C. H. Palatine.....
Ivanhoe Creamery.....	Ivanhoe	H. C. Payne.....
Diamond Lake Creamery.....	Diamond Lake	C. L. Hockmeyer.....
Grays Lake Creamery.....	Grays Lake	E. B. Neville.....
Milbourne Co-op. Co.....	Milbourne	A. H. Stewart.....
Gurnee Creamery.....	Gurnee	J. Austin.....
Wadsworth Creamery.....	Wadsworth	T. Strong.....
Russell Creamery.....	Russell	J. Quigley.....
Rondout Creamery.....	Rondout	G. W. Whitnell.....
Deerfield Creamery.....	Deerfield	A. Landon.....
Barrington Creamery.....	Barrington	W. McCredie Co.....
Gilmer Creamery.....	Gilmer	H. C. Patton.....
Cloverdale Creamery.....	Round Lake	J. Austin.....
Antioch Creamery.....	Antioch	G. D. Stanton.....
G. Knigge.....	Rockefeller	do
Round Lake Bottling Factory.	Round Lake	Clause Junge.....
Antioch Condensed Co.....	Antioch	do
Highland Park Creamery.....	Highland Park	do

LA SALLE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Utica Creamery Co.....	Utica	do
F. P. Ritchie.....	Leland	do
Leland Creamery.....	do	do
Farm Ridge Creamery.....	Farm Ridge	do

LEE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Chas. Rigley.....	Lee	do
Sanitary Co.....	Amboy	K. S. Townsend.....
Compton Creamery.....	Compton	Gylleck Bros.....
Stewart Creamery.....	Stewart	do
Dixon Condensed Co.....	Dixon	Bordens

LIVINGSTON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Dwight Creamery Co.....	Dwight	do

MACON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Benson Creamery.....	Decatur	J. Benson.....

MACOUPIN COUNTY.

Name of Creamery.	Postoffice.	Manager.
Mt. Olive Creamery.....	Mt. Olive	Green & Bolen.....
Gillespie Creamery.....	Gillispie .....	.....

MADISON COUNTY.

Name of Creamery.	Postoffice.	Manager.
A. H. Hastings.....	Upper Alton .....	.....
Marine Creamery Co.....	Marine .....	.....
Orange Creamery Co.....	Bethalto	H. E. Starr.....
Edwardsville Dairy Co.....	Edwardsville .....	.....
Diamond Springs Creamery Co	Grant Fork .....	.....
M. E. Craeane.....	New Douglas .....	.....
S. Reesman.....	N. Alton .....	.....
New Douglas Creamery.....	New Douglas .....	.....
St. Jacob Creamery.....	St. Jacob	Union Dairy Co.....
Mrs. J. Meyer.....	North Alton .....	.....

MARION COUNTY.

Name of Creamery.	Postoffice.	Manager.
Patoka Creamery.....	Patoka	Fehring & Facke.....
Sandoval Creamery.....	Sandoval	F. Fehring.....
Iuka Creamery.....	Iuka	E. H. Koulson.....
Vernon Creamery Co.....	Vernon .....	.....
Centralia Creamery Co.....	Centralia .....	.....

MARSHALL COUNTY.

Name of Creamery.	Postoffice.	Manager.
Henry Creamery.....	Henry	C. H. Snider & Co.....
Lone Tree Cheese Factory...	.....	.....
Morse Cheese Factory.....	.....	.....
Milo Cheese Factory.....	.....	.....

McDONOUGH COUNTY.

Name of Creamery.	Postoffice.	Manager.
Colchester Creamery.. .. .	Colchester	W. Boyd.....

McHENRY COUNTY.

Name of Creamery.	Postoffice.	Manager.
Ringwood Creamery Co.....	Ringwood	J. Carney.....
English Prairie Creamery.....	Spring Grove	J. B. Richardson.....
Solon Mills Creamery.....	Solon Mills	C. Osmond.....
Johnsburg Association.....	McHenry	S. Friend.....
Richmond Creamery Co.....	Richmond	E. Covell.....
Hartland Creamery Co.....	Woodstock	W. Desmond
McHenry Creamery.....	McHenry	C. L. Page.....
Frankville Creamery.....	Woodstock, R. F. D. 1..	M. D. Hoy & Sons.....
Oak Grove Creamery.....	Woodstock	F. W. Patrick.....
Oak Grove Creamery.....	Harvard	J. Quigley.....
Big Foot Prairie Creamery ..	Big Foot Prairie	Oatman & Co.....
Olden Creamery.....	Olden	W. D. Thompson
Maplewood Creamery.....	Harvard	Sullivan
Concklin Creamery.....	..do	Wait & Hovey.....
Harvard Creamery.....	..do	Oatman & Co.....
Chemung Creamery.....	Chemung	Crumel
Old Reilly.....	Marengo, R. F. D. 5..	I. J. Mix
Union Creamery.....	Union	F. Patrick.....
American Milk Prod. Co.....	..do	E. McKinney.....
Oatman Condensed Milk Co..	Huntley	Oatman & Co.....
Harmony Creamery.....	Marengo, R. F. D. 4..	Cornell Bros.....
Marengo Creamery.....	..do	..do
Dunham Creamery.....	Harvard, R. F. D. 1..	..do
Pleasant Grove Creamery.....	Reilly, R. F. D. 4.	F. W. Patrick.....
Maplewood Butter B. & C. Co..	Harvard	..do
Hartland Dairy Co.....	Hartland	..do
Johnsburg Creamery Co.....	Johnsburg	..do
Ringwood B. & C. Co.....	Ringwood	..do
Cleary Bros.....	Marengo	..do
A. E. Thompson.....	..do	..do
Griswold Lake Creamery Co..	McHenry	..do
Greenwood B. & C. Co.....	Woodstock	Bordens
Alden Condensed Co.....	Alden	Bordens
Rush Creek Creamery.....	Marengo	B. I. Ilcott.....
Borden's Condensed Milk Co..	Huntley	Bordens
Cornell Bros. Creamery.....	..do	Cornell Bros.....
Cornell Bros. Creamery.....	Marengo	..do
Greenwood Dairy.....	Greenwood	Mr. Long.....
Borden's Condensed Milk Co..	Crystal Lake	Bordens
Bowman's Dairy Co.....	..do	..do
Borden's Condensed Milk Co..	Algonquin	Bordens
Borden's Condensed Milk Co..	Woodstock	Bordens
Olson Sanitary Dairy.....	..do	A. J. Olson.....
Chemung Condensed Co.....	Chemung	Bordens
Borden's Milk Co.....	McHenry	..do
Borden's Milk Co.....	Hebron	..do
Spring Grove Dairy Co.....	Spring Grove	..do
Borden's Condensed Co.....	Marengo	..do
Hebron Creamery Co.....	Hebron	..do
F. W. Patrick.....	Marengo	..do
Silver Spring.....	Woodstock	..do
Ostend Creamery Co.....	..do	..do

McLEAN COUNTY.

Name of Creamery.	Postoffice.	Manager.
Paul Biech & Co.....	Bloomington .....	.....
Corn Belt Creamery Co.....	do .....	.....
Chenoa Creamery Co.....	Chenoa .....	.....

MERCER COUNTY.

Name of Creamery.	Postoffice.	Manager.
F. C. Dixon.....	New Boston .....	.....
Joy Creamery.....	Joy	W. W. Reynolds.....
Duncan & Scranton.....	Millersburg .....	.....

MONROE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Fountain Creamery.....	Waterloo	O. F. Sulz.....
Floaville Creamery.....	do .....	.....

MONTGOMERY COUNTY.

Name of Creamery.	Postoffice.	Manager.
Witt Creamery Co.....	Witt	J. W. Osborne.....
Coffeen Creamery.....	Coffeen	M. L. Roberts.....
Litchfield Creamery.....	Litchfield	Davis Bros.....
Donnellson Creamery.....	Donnellson	E. Moore.....
Hillsboro Creamery.....	Hillsboro	L. N. Smith.....
Irving Co-op.....	Irving	R. L. Funk.....
Central Ill. Creamery.....	Nokomis	M. B. Collier.....

OGLE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Myrtle Creamery.....	Myrtle	D. A. Hazzard.....
Oregon Creamery.....	Oregon	H. H. Hopkins.....
Adeline Creamery.....	Adeline	W. M. Jackson.....
Creston Creamery.....	Creston	G. Gurler.....
Egan Creamery.....	Egan	A. H. Barber & Co.....
Stillman Valley Creamery.....	Stillman Valley	H. J. Young.....
Harper Creamery.....	Harper	Jno. Newman Co.....
Leaf River Creamery.....	Leaf River	W. H. Jackson.....
Kleinsmith Bros.....	Adeline .....	.....
R. C. McCredie.....	Mt. Morris .....	.....
Straw & Toms.....	Polo .....	.....
The Grange.....	Oregon	G. Hopkins.....
Mt. Morris Creamery.....	Mt. Morris	do
Brookville Creamery.....	Brookville	John Newman Co.....
Forreston Creamery.....	Forreston	do

PEORIA COUNTY.

Name of Creamery.	Postoffice.	Manager.
Chillicothe Creamery.....	Chillicothe	C. H. Snider.....
Dunlap Creamery Co.....	Dunlap .....	.....
Church Creamery Co.....	Peoria .....	.....
Peoria Wholesale Ice Cream Co	Peoria	F. A. Fromme.....
Bottled Milk Co.....	do .....	.....

PERRY COUNTY.

Name of Creamery.	Postoffice.	Manager.
Pinckneyville Creamery.....	Pinckneyville	P. A. Graner.....
Cutler Creamery.....	Cutler	E. E. Heumill.....
Duquoin Creamery.....	Duquoin	J. W. Merriott.....
E. C. Salisbury.....	St. Johns .....	.....
Conant Creamery.....	Conant .....	.....
Coulterville Creamery.....	Coulterville .....	.....

PIATT COUNTY.

Name of Creamery.	Postoffice.	Manager.
Star Creamery Co.....	Loda .....	.....
Deland B. & C. Co.....	Deland .....	.....
Deland Creamery Co.....	do .....	.....

PIKE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Griggsville Creamery.....	Griggsville	T. Simpkin & Son.....
Blue Spring Creamery.....	do	H. Seeds.....
Baylis Creamery.....	Baylis	B. R. Haynes.....
Barry Creamery.....	Barry	A. Walters.....
Liberty Creamery Co.....	Liberty	E. Pond.....

PULASKI COUNTY.

Name of Creamery.	Postoffice.	Manager.
Villa Ridge Creamery Co.....	Villa Ridge .....	.....

RANDOLPH COUNTY.

Name of Creamery.	Postoffice.	Manager.
Schrieber Co.....	Ruma .....	.....
Sparta Creamery Co.....	Sparta .....	.....
Brennan Creamery Co.....	Chester, R. F. D. ....	.....
D. L. Darmon.....	Walsh, R. F. D. ....	.....
Steelville Creamery Co.....	Steelville	C. M. Wilson.....
Wellga Creamery Co.....	Wellga	H. Walter.....
Coulterville Creamery.....	Coulterville	E. Beckley.....
Shilo Hill Creamery.....	Shilo Hill	J. Schrader.....
Blair Creamery.....	Blair	J. P. Burns.....
Brennan Creamery.....	Brennan	Shroeder
R. C. Rulpaeth.....	Houston	R. C. Rulpaeth.....
Baldwin Blue Grass Creamery	Baldwin	S. T. Boyle.....
Red Bud Creamery.....	Red Bud	Shrieber Bros.....
Jordan Grove Creamery Co...	Baldwin .....	.....
Steelville Creamery Co.....	Steelville .....	.....
Wellga Creamery Co.....	Wellga .....	.....

RICHLAND COUNTY.

Name of Creamery.	Postoffice.	Manager.
Olney Creamery.....	Olney	G. L. Newberry.....
Clay City Creamery.....	Clay City	E. McGilton.....
Geo. L. Newberry.....	Calhoun .....	.....
Claremont Creamery Co.....	Claremont .....	.....
Samuel Stillwell.....	Parkersburg .....	.....
Parkersburg Creamery.....	..do	W. L. Richards.....
Noble Creamery.....	Noble .....	.....
Berryville Creamery.....	Parkersburg, R. F. D. ..	S. Stillwell.....

ROCK ISLAND COUNTY.

Name of Creamery.	Postoffice.	Manager.
Tri-City Bottled Milk Co.....	Rock Island .....	.....
Coe Creamery.....	Pt. Byron	B. S. Daley.....
Barstow Creamery.....	Barstow	P. F. Gerhardt.....
Rose Hill Creamery.....	Hampton	R. F. Filmer.....
Cordova Creamery.....	Cordova	J. D. Allen.....
Hillsdale Creamery.....	Hillsdale	Tri-City Co.....
B. A. Filmer.....	Pt. Byron .....	.....
Pt. Byron Creamery.....	..do	F. B. Filmer.....
Taylor Ridge Creamery.....	Taylor Ridge	Ramsey
Milan Creamery.....	Milan .....	.....

SALINE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Harrisburg Creamery.....	Harrisburg	D. W. Anderson.....
M. M. Fox.....	Rileyville .....	.....
W. H. Thornburg.....	..do .....	.....
A. M. Todd.....	..do .....	.....

SANGAMON COUNTY.

Name of Creamery.	Postoffice.	Manager.
West Sangamon Creamery Co.	New Berlin .....	.....
New Berlin Creamery.....	do .....	.....

SHELBY COUNTY.

Name of Creamery.	Postoffice.	Manager.
Forest Creamery.....	Siegel	A. W. Bigler.....
Johnson Sant. Creamery.....	Stewardson	L. Johnson.....
Richland Creamery.....	Strausburg	E. L. Krump.....
Stewardson Creamery.....	Stewardson	J. B. Singer.....
Rural Township Creamery.....	Tower Hill	W. E. Kenna.....
Harrisburg Creamery.....	Harrisburg	D. H. Anderson.....
Union Dairy Co.....	Stewardson .....	.....
Rose Township Creamery Co..	Shelbyville .....	.....

ST. CLAIR COUNTY.

Name of Creamery.	Postoffice.	Manager
St. Libory Creamery Co.....	St. Libory	Rutter Bros.....
Smithton Creamery.....	Smithton .....	.....
Mutual Creamery.....	Mascoutah	G. F. Wanbacker.....
Star Creamery.....	Millstadt	E. P. Miller.....
Marissa Creamery	Marissa	Lyons & White.....
Millstadt Creamery.....	Millstadt	F. L. Baltz.....
Floraville Creamery.....	Floraville	L. I. Zimkermann.....
H. Schoettler Creamery.....	Belleville	H. Schoettler.....
O'Fallon Creamery.....	O'Fallon	J. Munier.....
Ammermon & Sanger Mills Sta.	Lebanon	J. L. Ammermon.....
Lebanon Creamery.....	do .....	.....
New Athens.....	New Athens .....	.....
Belleville Creamery.....	Smithton .....	.....

STARK COUNTY.

Name of Creamery.	Postoffice.	Manager.
Wyoming Creamery.....	Wyoming .....	.....

STEPHENSON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Orangeville Mutual Benefit As.	Orangeville .....	.....
Cedarville Creamery.....	Cedarville	A. Richard.....
Buena Vista Creamery.....	Buena Vista	P. Poultaroo.....
Blue Label Factory.....	Winslow	F. Carlson.....

STEPHENSON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Orangeville Factory.....	Orangeville	J. P. Younger Co.....
Afolkey Cheese Factory.....	Afolkey	G. Rosemond.....
Hickory Grove Cheese Factory...	Dakota	M. Madden.....
Rock Grove Cheese Factory...	Rock Grove	W. H. Maurer.....
Sciota Milk Co.....	Sciota Mills	J. H. Britt.....
Damascus Creamery.....	Damascus	J. A. Phillips.....
Red Oak Creamery.....	Red Oak	S. Weagle.....
Davis Creamery Association...	Davis	F. G. Beardsley.....
Rock City Creamery.....	Rock City	Chas. Logan.....
Freeport Creamery.....	Freeport	Jno. Newman Co.....
Winneshock Creamery.....	Winneshock	Lester
Eleroy Creamery.....	Eleroy	Waugney
Bolton Creamery.....	Freeport	Jno. Newman Co.....
Dakota Creamery.....	Dakota	Jno. Newman Co.....
McConnell Creamery.....	McConnell	P. Danielson.....
Eleroy Creamery.....	Eleroy	E. D. Geasman.....
German Valley Creamery.....	German Valley	G. Smith.....
Lena Creamery.....	Lena	J. A. Clarity.....
Banned Cond. Milk Co.....	Pearl City	J. Schiedler.....
Pleasant View Creamery.....	Pearl City R. F. D. 1....	Jno. Newman Co.....
Mitchell & Auman	Kent .....	.....
F. Hauser & Son.....	Lena .....	.....
Mitchell & Studebacker.....	Loran .....	.....
Florence Creamery.....	Florence .....	.....
Kent Creamery Co.....	Kent	Mitchell & Auman.....
A. B. Kesser.....	Pearl City .....	.....
Pearl City Creamery Co.....	do	Lester
W. H. Maur.....	Rock Grove .....	.....
Afolkey Creamery.....	Afolkey	J. P. Younger.....

VERMILION COUNTY.

Name of Creamery.	Postoffice.	Manager.
Sanitarium Creamery.....	Danville	W. Hooton.....
Royal Ice Cream Co.....	do	Wintrowd & Schenk....
Germantown Creamery.....	Germantown .....	.....
Ridge Farm Creamery.....	Ridge Farm .....	.....
Oakwood Creamery Co.....	Oakwood	E. D. Geasman.....
Rossville Creamery Co.....	Rossville .....	.....
Bismark Creamery Co.....	Bismark .....	.....

WABASH COUNTY.

Name of Creamery.	Postoffice.	Manager.
Price & Southerland.....	Allendale .....	.....
Linn Creamery.....	Linn .....	.....

WARREN COUNTY.

Name of Creamery.	Postoffice.	Manager.
Little York Creamery.....	Little York .....	.....

WASHINGTON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Venedy Creamery Co.....	Venedy .....	.....
Ashley Creamery Co.....	Ashley .....	.....
New Minden Creamery.....	New Minden	C. L. Weike.....
Grapemann Dairy.....	Addieville	G. Hoelscher.....
Nashville Creamery.....	Nashville	P. Ziegler.....
Pecan Grove Creamery.....	Okawville	F. Moekle.....
Hoyleton Creamery.....	Hoyleton	A. Maschhoff.....
Addieville Creamery Co.....	Addieville .....	.....
Great Western Creamery.....	Stone Church .....	.....

WAYNE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Cisna B. & C. Co.....	Cisna	G. G. Archibald.....
Wayne Creamery.....	Wayne City	W. A. Anderson.....
Fairfield Creamery.....	Fairfield	W. W. Sims.....

WHITE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Grayville Creamery Co.....	Grayville .....	.....

WHITESIDE COUNTY.

Name of Creamery.	Postoffice.	Manager.
Rock Falls Creamery.....	Rock Falls .....	.....
Sterling Cond. Co.....	Sterling	Bordens
Prophetstown Creamery.....	Prophetstown	F. Johnson.....
Erie Creamery.....	Erie	G. A. Wilcox.....
Lyndon Skim Milk Station...	Lyndon	F. Buell.....
Albany Creamery Co.....	Albany	F. Daley.....
Sterling B. & C. Co.....	Sterling	Sterling B. & C. Co....
Rock Island Junction Creamery	Sterling, R. F. D.	W. F. Elgin.....
Elgin & Buell.....	Sterling	S. J. Elgin.....
Jordan Creamery.....	do	Sterling B. & C. Co....
Morrison Creamery.....	Morrison	Jno. Newman Co.....
Gilbert's Creamery.....	Sterling .....	.....
Genesee Creamery.....	Sterling, R. F. D. 2.	Sterling B. & C. Co....
Fenton Creamery.....	Fenton	J. Wright & Son.....
Round Grove Creamery.....	Round Grove	Jno. Newman Co.....
Spring Valley Creamery.....	Morrison	do
Robert Burchell.....	Erie .....	.....
James F. Miller.....	Rock Falls .....	.....
Tampico Creamery.....	Tampico	F. Johnson.....
Coleta Creamery.....	Coleta	J. M. Gilbert.....
Garden Plain Creamery.....	Garden Plain	E. C. Dodge & Co.....
Morrison Condensed Co.....	Morrison	W. Page.....

WILL COUNTY.

Name of Creamery.	Postoffice.	Manager.
Barber Corner Creamery.....	Plainfield R F D 4.....	C. Hogrefe.....
Eagle Lake Creamery.....	Beecher	H. C. Englekind.....
Maple Hill Creamery.....	Lockport	S. W. Jones & Son.....
State Line Creamery.....	Beecher	F. Wehmann.....
Wheatland Creamery.....	Plainfield R. F. D. 4.....	Palmer & Patterson....
New Lenox Creamery.....	New Lenox	G. L. Hilton.....
Manhattan Creamery.....	Manhattan	E. L. Wilson.....
Beecher Creamery.....	Beecher	J. Gregerson & J. W. Dowd
Goodings Grove Creamery....	Goodings Grove	H. J. Holm.....
Interstate Creamery.....	Bemes	H. C. Wehmhoefer.....
Acorn Creamery.....	Crete	T. C. Tatge.....
DuPage Valley Creamery Co..	Plainfield .....	.....
Plainfield Creamery.....	Plainfield .....	.....
Beecher Bottling Plant.....	Beecher	P. Speilson.....
Weber Dairy Co.....	Joliet .....	.....
Flint Sanitary Milk Co.....	..do .....	.....
Wm. Ende.....	Monee .....	.....

WILLIAMSON COUNTY.

Name of Creamery.	Postoffice.	Manager.
Johnson City Creamery.....	Johnson City	S. T. Welch.....

WINNEBAGO COUNTY.

Name of Creamery.	Postoffice.	Manager.
Laona Creamery Co.....	Durand .....	.....
Coon Creek Creamery.....	Rockton	J. Powell.....
Spring Brook Creek Creamery	Davis	F. Cross.....
Laona Creamery.....	..do	O. H. Anderson.....
Durand Creamery.....	Durand	Sturtevant & Wright...
Cherry Valley Creamery.....	Cherry Valley	C. M. Wait.....
Shirland Creamery.....	Shirland	Beatrice Co.....
Roscoe Creamery.....	Roscoe	C. M. Wait.....
Argyle Creamery Co.....	Argyle .....	.....
Harlem Creamery.....	Harlem	W. H. Carmichle.....
Edwardsville Creamery.....	Winnebago	C. A. Miller.....
Elida Creamery.....	Winnebago R. F. D. 1..	J. Wagner.....
Lysander Creamery.....	Pecatonica	J. A. Provoost.....
Riverside Creamery.....	Rockford R. F. D. 1..	D. Smith.....
Winnebago Butter Mfg. Co...	Winnebago	C. P. Coolidge.....
Forest City Creamery Co....	Rockford .....	.....
Hopkins-Hubbard Co.....	..do .....	.....
M. Richmond.....	..do .....	.....
Westfield Creamery Co.....	Winnebago .....	.....
Walnut Grove Creamery.....	Davis	F. Cross.....
Pecatonica Condensed Co....	Pecatonica	McCawna & Fragier....
Union Dairy Co.....	Rockford .....	.....
Rockford Creamery Co.....	..do .....	.....
Seward Creamery Co.....	Seward .....	.....

WOODFORD COUNTY.

Name of Creamery.	Postoffice.	Manager.
Metamora Creamery Co.....	Metamora .....	.....

MILK BOTTLING PLANTS.

Name.	Location.	Office.
Beecher Creamery Co.....	Beecher, Ill.....	.....
Borden's Condensed Milk Co..	Algonquin, Ill.....	Chicago, Ill.....
Borden's Condensed Milk Co..	Cary, Ill.....	..do
Borden's Condensed Milk Co..	Belvidere, Ill.....	..do
Borden's Condensed Milk Co..	Elgin, Ill.....	..do
Borden's Condensed Milk Co..	Bassetts, Ill.....	..do
Borden's Condensed Milk Co..	Hampshire, Ill.....	..do
Borden's Condensed Milk Co..	Marengo, Ill.....	..do
Borden's Condensed Milk Co..	McHenry, Ill.....	..do
Borden's Condensed Milk Co..	Sterling, Ill.....	..do
Borden's Condensed Milk Co..	Sycamore, Ill.....	..do
Borden's Condensed Milk Co..	W. Chicago, Ill.....	..do
Borden's Condensed Milk Co..	Woodstock, Ill.....	..do
Borden's Condensed Milk Co..	Aldine, Ill.....	..do
Borden's Condensed Milk Co..	Hebron, Ill.....	..do
Bowman Dairy Co.....	Bristol, Ill.....	..do
Bowman Dairy Co.....	Barrington, Ill.....	..do
Bowman Dairy Co.....	Crystal Lake, Ill.....	..do
Bowman Dairy Co.....	Elburn, Ill.....	..do
Bowman Dairy Co.....	Howard, Ill.....	..do
Bowman Dairy Co.....	Mokena, Ill.....	..do
Bowman Dairy Co.....	Palatine, Ill.....	..do
Bowman Dairy Co.....	Poplar Grove, Ill.....	..do
Bowman Dairy Co.....	St. Charles, Ill.....	..do
Ira J. Mix Dairy Co.....	Bowes, Ill.....	.....
Ira J. Mix Dairy Co.....	Burlington, Ill.....	.....
Ira J. Mix Dairy Co.....	Charter Grove, Ill.....	.....
Ira J. Mix Dairy Co.....	East Plato, Ill.....	.....
Ira J. Mix Dairy Co.....	Genoa, Ill.....	.....
Forest Glen Creamery Co.....	Round Lake, Ill.....	.....
Huntley Dairy Co.....	Bartlett, Ill.....	.....
Kee & Chappell Co.....	North Aurora, Ill.....	.....
Kee & Chappell Co.....	Batavia, Ill.....	.....
Kee & Chappell Co.....	Big Foot, Ill.....	.....
Mt. Prospect Creamery Co.....	Mt. Prospect, Ill.....	.....
Murphy & Co.....	Virgil, Ill.....	.....
Olson, A. J.....	Woodstock, Ill.....	.....
Quigley & Co.....	Myrtle, Ill.....	.....
Quigley & Co.....	Russell, Ill.....	.....
Wieland Dairy Co.....	Libertyville, Ill.....	Chicago, Ill.....
Wieland Dairy Co.....	Solon Mills, Ill.....	..do
Wieland Dairy Co.....	Spring Grove, Ill.....	..do
Yore Bros.	Libertyville, Ill.....	.....
Patton Milk Co.....	Lake Zurich, Ill.....	.....
Patton Milk Co.....	Palatine, Ill.....	.....
Patton Milk Co.....	Schaumburg, Ill.....	.....
Victor May	Huntley, Ill.....	.....

MILK CONDENSING PLANTS.

Name.	Location.	Office.
American Milk Products Co...	Capron, Ill.....	
American Milk Products Co...	Union, Ill.....	
Aviston Milk Condensing Co...	Aviston, Ill.....	
B. & O. Milk Condensing Co...	Carlyle, Ill.....	
Borden's Condensed Milk Co...	Elgin, Ill.....	Chicago, Ill.....
Borden's Condensed Milk Co...	Huntley, Ill.....	..do
Borden's Condensed Milk Co...	Carpentersville, Ill.....	..do
Borden's Condensed Milk Co...	Dixon, Ill.....	..do
Borden's Condensed Milk Co...	Algonquin, Ill.....	..do
Borden's Condensed Milk Co...	Sterling, Ill.....	..do
Borden's Condensed Milk Co...	Belvidere, Ill.....	..do
Cornell Bros.....	Huntley, Ill.....	Elgin, Ill.....
Cornell Bros.....	Maple Park, Ill.....	..do
Cornell Bros.....	Garden Prairie, Ill.....	..do
Edwardsville Milk Cond. Co...	Edwardsville, Ill.....	
Elgin Cond. Milk & Cream Co.	Gilberts, Ill.....	
Greenville Milk Condensing Co	Greenville, Ill.....	
Helvetia Milk Condensing Co.	Highland, Ill.....	
Helvetia Milk Condensing Co.	Greenville, Ill.....	
Libby, McNeil & Libby Co...	Morrison, Ill.....	
Marshall Condensed Milk Co...	Marshall, Ill.....	
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CONSERVATION OF ENERGY AND ITS RELATION TO THE DAIRYMAN.

By

Wilber J. Fraser, Chief in Dairy Husbandry, University of Illinois.

One of the biggest national problems which is receiving attention today, is the conservation of our natural resources. No one doubts the importance or timeliness of this great question. But a still larger problem for us to consider is the saving of human energy, for there is much waste of human lives in weary, unprofitable toil. To many a dairyman this conservation means that he could increase his profits tenfold, as others have done, without running down the land or robbing some other farm, by simply putting intelligence into his business, and thus win for himself and family the opportunity for greater comfort, development and useful service to humanity.

The following modified quotation is in point:

Strangely enough, farming, the first of all industries, has been the last to break away from dull plodding and blind drudgery, and to share in the benefits of intelligent understanding. Until the present generation, the farmer has never known what he was doing, nor why he did it. How bitter has been the tragedy of this long groping in the dark by the man who has not only eaten his own bread, but fed the world by the sweat of his over-burdened body. To the unthinking, life is but endless toil and drudgery, while pleasure and inspiration come to the man who understands his work.

Pitiful Picture of Wasted Energy.

What a picture is the following, taken from a recent letter written by a well known resident of Northern Illinois: "Within a radius of ten miles from my door there are at least 300,000,000 pounds of milk produced each year (an average of ten 8-gallon

cans per day for every quarter section of land) yet I have lived with this people for 30 years, and as a matter of fact, easily verified, no other department of life of which I am cognizant can measure with it in its deplorable ignorance. Here they are a great colony of people with no literature with which to inform themselves, and still producing a food for human beings to live upon.

"Another feature is, not one dairyman in twenty has anything like a true conception of the production of his individual cows. I think now of no one who is making tests to know if each cow is profitable, or the reverse. Again, where great ignorance such as this prevails, also great filth goes hand in hand." Think of that from one of the best dairy regions in the state. Do not these conditions show a waste of energy that calls for a campaign of education?

The Means of Higher Living.

Money does not make the man, and yet it has been found impossible to administer to the better man until his physical environment is comfortable and respectable. The highest success comes to the man from intelligent, conscientious effort. Strict laws govern our achievement. If a man can double his earnings by simply developing and using his brain power, and conserving his energy so that he can live respectably and bring up his children to their highest usefulness, this is a conservation of natural resources of even greater consequence than preserving our forests and our mines.

The Dairyman's Wasted Energy and Loss of 757 Million Dollars.

Why is the average annual production of the cows in the United States 150 pounds of butter fat, causing a loss of \$1.40 to the owner, instead of 325 pounds of butter fat, making a profit of \$40.40 annually—the point to which some dairymen in Illinois have increased their grade herds by simply putting intelligence into the business, and this is by no means the maximum of what

can be done. There is no reason why all of the herds in the United States should not be yielding as large an annual production as these, if they were as intelligently handled. Dairymen do not stop to consider the tremendous trifles in their business. While the difference in earning power of these cows is only 11½ cents per day, this small increase for each of the 18,000,000 cows in the United States would mean an additional profit of \$757,000,000 annually for the dairymen.

The Folly of Not Knowing.

We have been talking about this testing and keeping a record of the individual cows so long that we wish it were not necessary to say anything more about it, but so long as dairymen persist in being ignorant of their cows' production, we shall keep pounding away until they become acquainted with each individual cow and save themselves the folly of converting high-priced grain into "dribbles of milk and loads of dung." Bookkeeping has shown that the shiftless hit-or-miss breeding of scrubs does not pay expenses. The argument is plain enough. A dairy cow is a machine for converting food into dairy products, and the best economy and surest profit consists in employing the best machines obtainable. Remarkable improvement has come with the grading up of dairy herds.

The price of dairy products has advanced, but not in proportion to the advance in the prices of grain and land, and under the present conditions it is the height of folly to milk cows that do not pay expenses. It is, therefore, a matter of great concern to the dairyman to know what his cows are doing.

Business Principles in All Details.

"The very strength of the dairy business is its weakness." Because it is so generally remunerative, people have come to believe that money can be made at it, no matter how conducted. Milk production is like a chain made up of many links, and the final result is no stronger or better than the weakest link which limits the profits.

Applied and Misapplied Energy.

To illustrate the vast difference in earning power of cows, a few examples of Illinois herds tested by the Experiment Station, showing the production and profit or loss from each individual cow, computed according to Illinois Agricultural Experimental Station Circular 134, are here given.

A Hoodoo Herd Losing Money Every Day.

The following herd of 15 cows is phenomenal in the proportion of those on the losing side of the account, and also in the excessive loss on many of them. Either one of the two poorest cows lost the owner almost as much money as was made by all the cows on the credit side of the account.

Herd No. 1.

No. cow	Lb. milk	Lb. fat	Percent fat	Profit	Loss
1	1204	49	4.07		\$27.52
2	1236	50	4.05		27.20
3	2944	88	2.99		15.17
4	2597	91	3.50		15.38
5	2548	98	3.85		13.18
6	2475	99	4.00		13.18
7	2569	105	4.09		10.98
8	3164	117	3.70		8.37
9	2829	123	4.34		8.67
10	3380	149	4.41		1.58
11	4582	158	3.45	\$1.41	
12	4146	174	4.20	3.41	
13	4103	177	4.31	5.41	
14	4993	191	3.82	8.40	
15	4435	200	4.51	10.21	
				\$28.84	\$141.23
					28.84
					\$112.39
Av.	3147	124	3.94		7.49

Difference in profit between best and poorest cow, \$37.73.

The most striking number in the table is the second one from the bottom in the last column, showing a total loss of \$112, which means that this man received \$112 less for the products from his dairy herd than he would have received had he simply sold the feed. It is well, also, to note that the profit from the best cow is only \$10.21, and that this best cow is indeed absolutely inferior to the poorest cow in many of the herds in the state.

This is a deplorable state of affairs—a man trying to support a family with a herd of cows utterly unable to return a profit. The actual conditions of this man's affairs is shown by the last two columns of the table, and is a forceful answer to the question, "Why test cows?" No man would conduct a losing business when fully aware of what he is doing. "The most important education a man can have is to know how to take care of himself and those dependent upon him."

Herd No. 2, 36 Cows, Return \$15 Profit Per Cow.

Herd No. 2 has but three cows on the losing side of the account. Its average production is above that of the herds of the state, and shows a profit of \$15 per cow. This herd of 36 cows made a total profit of \$540.11 above cost of feed and labor. Yet, good as this herd is, the man with herd No. 3, containing only 13 cows, did more real business, so far as getting ahead is concerned.

Little Dairy that Brings the Better Things of Life.*

In the following herd, although of grade cows, its lowest cows returned a profit of over \$22, which is more than twice that of the best cow in herd No. 1. The difference between the individuals of the herd is large, but the star boarders were long ago eliminated, as a result of several years' work keeping individual production records of the cows and replenishing the herd by using a good pure-bred sire and raising the heifers from the best cows.

*For a more detailed account of how this herd was managed and how the farming operations were conducted, see Illinois Agricultural Experiment Station Circular No. 113.

HERD No. 2.

No. cow	Lb. milk	Lb. fat	Percent fat	Profit	Loss
1	4277	114	2.73		\$9.76
2	3869	137	3.52		3.58
3	4030	139	3.45		3.39
4	4717	163	3.46	\$1.60	
5	5202	165	3.17	4.27	
6	5667	168	2.96	4.80	
7	5286	169	3.20	4.27	
8	5076	170	3.35	4.00	
9	5150	176	3.42	6.47	
10	6201	177	2.85	7.41	
11	5367	184	3.43	6.47	
12	7114	191	2.68	10.05	
13	4983	200	4.01	10.60	
14	5234	201	3.84	10.87	
15	6618	202	3.05	11.96	
16	5572	203	3.64	11.13	
17	6252	206	3.29	14.01	
18	6695	208	3.11	14.30	
19	6952	212	3.05	14.45	
20	7203	213	2.96	14.60	
21	7161	214	2.99	14.60	
22	5944	219	3.68	16.06	
23	6725	227	3.38	18.70	
24	7683	236	3.07	21.49	
25	9272	238	2.57	22.41	
26	6935	242	3.49	21.05	
27	7475	243	3.25	21.35	
28	7453	250	3.35	23.55	
29	7429	252	3.39	23.55	
30	7342	253	3.45	23.40	
31	7713	261	2.38	25.89	
32	7792	266	3.41	28.09	
33	8012	286	3.57	32.64	
34	9592	295	3.08	35.75	
35	8702	298	3.42	35.32	
36	8588	327	3.81	41.76	
				\$556.87	\$16.76
				16.76	
				\$540.11	
AV.	6533	214	3.28	\$15.00	

Difference in profit between best and poorest cow, \$51.55.

On only 96 acres of land, with practically no expense for purchased cows or feed, the owner is making with this herd a comfortable living for himself and family. He is an enthusiast instead of a plodder, reads dairy literature, turns drudgery to pleasure, and has time and money for the better things of life. He receives pay not only for his manual labor, but the neat little sum of \$554 as a clear profit, to compensate for his head work.

As a result of this head work, the owner increased, in but four years, the average production of his herd from 224 pounds to 326 pounds of butter fat per cow. This means that he increased the average production of an already profitable herd, 102 pounds of butter fat. What has been done with this herd can therefore be done with every other herd in the State of Illinois, if as intelligently handled.

Herd No. 3.

No. cow	Lb. milk	Lb. fat	Percent fat	Profit	Loss
1	5986	252	4.20	\$22.66	
2	7920	254	3.21	23.84	
3	7600	260	3.42	25.75	
4	7169	293	4.08	32.20	
5	8300	295	3.55	35.00	
6	9010	322	3.58	39.87	
7	9045	333	3.68	42.07	
8	9043	337	3.72	44.27	
9	8877	344	3.87	44.27	
10	9999	348	3.48	53.53	
11	11293	376	3.33	63.99	
12	7632	403	5.28	56.69	
13	10289	422	4.10	69.70	
				\$553.84	
Av.	8628	326	3.77	\$42.60	

Difference in profit between best and poorest cow, \$47.04.

Herd Difference of \$50 Per Cow—Difference of \$100 Between Best and Poorest Cow.

The cows in the first herd lacked \$7.49 each of paying for their feed and care, while each cow in the last herd made a profit of \$42.60, making a difference in income of over \$50 per cow between the two herds. The best cow in the herd brought in \$69.70 profit, while the poorest cow in the herd was kept at a loss of \$27.52, making a difference in the earning power of the two cows of nearly \$100 annually.

\$1,607 Worth of Butter From 14 Cows.

When it comes to actual conditions, these examples do not tell half the truth, for the poorest dairyman lived in one of the best dairy regions in the state, and yet this herd and its care were such that the product would not be accepted at a Borden milk plant which was only a short distance away. In a direct contrast to this, the owner of the better herd lives in one of the poorest dairy regions, and eleven miles from his market, yet his butter was of such excellent quality that it commanded an extra price and the butter from 14 cows brought, last year, \$1,607.

Net Receipts of \$4,000 From 60 Acres.

Another guide post for the dairyman is the example of a man who, on 60 acres of land, keeping 23 cows and the young stock, received an average the last five years of \$2,500 for the cream alone, \$1,500 for pure-bred young stock sold, besides \$500 for hogs raised largely on the skim milk, making the total receipts \$4,500. He paid out \$500 for feed stuffs, and this expense might have been saved had he raised alfalfa, as he is now commencing to do. The average net receipts from the 60 acres was \$4,000.

Mistakes for 45 Years, then Large Success.

There is but one highway open to real success, and this is persistent, consistent and intelligent application to something

that is worth while. A very successful dairyman, over sixty years of age, recently said: "I have made the greater part of my money since I was forty-five. Up to that time, I was principally engaged in making mistakes. I was following the example of my neighbors, who were not real thinking dairymen. Then I struck out for myself, and I have been correcting a host of mistaken notions about cows, stables, feed, and farming in general, and I have made nearly all I have since that time." The difficulty with many dairymen is, they never wake up.

The Decisive Factor of Success is the Dairyman Himself.

This is the day of thinkers, and it is to the dairyman's advantage to belong to this class. The proposition confronting the dairyman today is not primarily a matter of location, soil, or climate; it is he, himself, that stands in the way of his own progress. Few people realize what intelligence, care and study, what patience, observation and experience are needed to make a good dairyman, to interpret to the mind the language of the cow in such a manner as to understand her every need and be able to properly supply it. The inherent and fatal weakness of many people is that they wholly ignore the really important and decisive factor of success in all fields of human activity, viz: trained and intelligent judgment, based on sound theory and practice. The cause and cure for the backwardness of the dairyman is in his mind, and in the solution of his problems chief prominence must be given to the human factor. The trouble with many dairymen is that they think they know, which is the worst possible kind of ignorance. "The first step to knowledge is to know that we are ignorant." Our most successful dairymen have attained their achievements, not by luck, but through intelligent forethought.

Keep Records and Stop Guessing.

The chief obstacle to progressive dairying is carrying it on in a slipshod manner without the well balanced, intensive methods so important to profitable milk production. Many dairymen

attempt to make money without the application of business principles. The milk producer must stop guessing, and know for sure what the results will be of the different operations conducted in different ways, and in each case adopt the one that will return the most profit. It is the net result from a cow that tells whether she is making a profit or not. We cannot know what that net result is if we do not keep a record.

A great mass of the cows milked each day are kept by men who are simply cow keepers and not dairymen. Even on what would be considered good dairy farms there is frequently aimless breeding, thoughtless and shiftless feeding, care, and housing of the cows. All of this results in lack of sufficient returns. The investigation of the dairy conditions of the state, made by this department in the past twelve years, shows plainly that the dairy farmers are not receiving the profits due them for the investments of money, time and labor that are put upon their farms.

Why the Business Often Fails to Return Profits.

Dairying needs a re-adjustment; dairy cows instead of just cows; dairy knowledge instead of "as father did." Dairymen have a vague and confused idea as to what it is, after all, that determines their profits in dairy farming. Large sums of money are invested in numerous acres of land, extensive and expensive buildings, costly horses, tools and machinery, high priced feed and labor, and all of this outlay turned to raising crops that do not yield anything like the amount of digestible nutrients per acre that should and could be obtained, and to feeding and caring for a herd of cows utterly unable to return a profit because of their inefficiency and poor care. The same expenditure of money and labor bestowed in an intelligent manner upon the same farm and an efficient dairy herd would return a most handsome profit.

\$1,800 From 40 Cows vs. \$2,000 From 20 Cows, Half the Labor and Half the Land.

Here are a few more contrasting examples showing what intelligent application versus the lack of it does in the dairy business. One dairyman produced \$2,000 worth of milk from 20

cows, or \$100 per cow. A neighbor bestowed twice as much labor on 40 cows and sold only \$1,800 worth of milk, or \$45 per cow, barely paying expenses, while the first man made a profit of over \$1,000. Yet the second man said he did not have time to spend a few minutes each day weighing and testing the milk from each cow. Instead, he spent four long, weary years in raising and harvesting the crops on a 160-acre farm, and feeding and milking 40 cows, to make as much profit as his neighbor did in one year with but half the number of cows, half the land, and half the labor.

Six Herds Show Great Contrast.

At a large condensing factory in Illinois the men delivering milk from the poorest three herds received \$30.62 per cow for the year's milk, while the three best herds, at the same factory, returned \$98.94 per cow for the milk during the same year. As no skim milk was returned, the poorest herds did not pay for the feed and labor, while the best three herds made a profit of something over \$50 per cow. Imagine what this difference means to the families depending upon these herds for a living.

Delusion About Proceeds and Profits.

The question arises, why do these men keeping the poor herds continue in this way? No one can answer—not even themselves. The only explanation that might suggest itself is that even the dairymen with the poor herds receive quite a large check at the end of each month, and that they fail to distinguish between total receipts and net profits. This delusion blinds the dairyman's vision to the actual facts, and has been the cause of many a failure. Your fortune and mine does not depend upon the total amount of money that goes through our hands, but upon the percent of profit. Simply because a dairyman handles considerable money, it does not necessarily follow that he is doing a profitable business, for he may not be paying expenses and interest.

All six of these dairymen had the same air above them, the same soil beneath them, and the same market. Why, then, this enormous difference in returns? It is simply a question of the brains put into the business. All over this country are individual dairymen whose success is noticeable, and who illustrate by their results that no matter what the locality, there are great possibilities in dairying when intelligently pursued. They are examples of what brains can do for a man.

Fortunes Made and Fortunes Lost.

Fortunes have been made and fortunes have been lost in dairy farming. To substantiate this, and to show the tremendous waste of energy on dairy farms, the following examples are given:

Two men of good habits started in the dairy business twenty-five years ago, the one with nothing, and the other with a 320-acre farm, paid for. At the present time, the former has a large farm, well stocked with a dairy herd, and good buildings, besides a bank account, all of which was made from his dairy herd. The latter, through poor judgment, guess work, and non-application of the best methods, lost the farm he already had. The purchasing of large amounts of high-priced concentrates was one factor in this failure. It finally took 80 acres of land to pay the bill for these purchased feeds, alone.

One Dairyman Loses a Farm; His Successor Takes in \$840 a Month

Another man, owning a farm of 120 acres, kept 20 cows and produced from two to four cans of milk per day, the proprietor and two hired men doing the work. The profits were so small that the farm was finally lost. The farm was purchased by a man who kept three hired men and 63 cows on the same 120 acres of land, producing thirty cans of milk per day during the flush of the season. His milk for one month, shortly after he began, brought \$840. This is an example of brain fertility, and not soil fertility, for the soil was the same.

Great Economy of Efficient Cows.

The following figures, taken from Agricultural Experiment Station Circular No. 134, Cow Index of Keep and Profit, are based upon the value of the cow, milk, butter fat, calf, and manure, and also upon the cost of feed, labor, depreciation on cow, interest, taxes, housing, etc. The results show that, under ordinary farm conditions, and with the product sold on the common creamery market, a cow must produce approximately 4,000 pounds of milk and 160 pounds of fat to pay for the feed and labor. In other words, this is the dead line. Cows producing less than this are kept at a loss. For every 1,000 pounds of milk produced above this, the cow returns a profit of \$10.

Doubling the Production Gives Six times the Profit.

A cow producing 5,000 pounds of milk brings in a profit of \$10, while a cow producing 8,000 pounds of milk returns a profit of \$40, or four times as much. In other words, ten cows producing 8,000 pounds of milk would return as much profit as forty cows producing 5,000 pounds of milk, but the former involves only one-fourth the labor. Herein lies the great advantage of keeping a herd of high average production, even though the herd be small.

Profit or Loss from Cows of Different Productions.

A cow producing 10,000 pounds of milk returns a profit of \$60, or six times as much as a cow producing 5,000 pounds of milk, yet the production is only twice as great.

Illinois Has Two-thirds of a Million Cows That Make No Profit.

The seriousness of the dairy situation in Illinois may be realized when we know that one-third of the million cows milked twice each day are below the dead line, and every one is losing the owner money, and that it takes all the profit made by the middle third to make up the loss on the poorest third. In other

words, if the poorest two-thirds of the cows in Illinois were disposed of, the net profits from dairying would be the same as now. All of the profit made in Illinois dairying, and not eaten up by poor cows, comes from the best third of the cows in the state.

Appalling Waste of Energy Unseen by the Dairymen.

There are two million people milking eighteen million cows twice every day in the United States, yet one-third of this energy is worse than wasted, as there are six million cows that never did anything to help sustain the farm, and never can or will. Cows of this kind are bred on from generation to generation, and when we stop to consider how easy it is to apply the dairyman's yard stick, in the scales and Babcock test, to every herd, and yet realize that less than one per cent of the two million dairymen in the United States are using this yard stick today, it staggers us that such conditions as these should continue to exist. Such a waste of energy is appalling. Dairymen in general do not see the facts represented.

Not a Township Up to Possibilities.

No matter whether we believe it or not, the vital question of good and poor cows is a living issue confronting every dairyman all the time, and he cannot get away from it. There is not a single county, nor even a township, in any state, which has yet come anywhere near reaching the maximum possibilities of milk production.

One Farmer's Eight Cows Return \$4,558.

One farmer in Illinois had 8 cows on an official test that produced last year 136,715 pounds of milk, or an average of 17,089 pounds per cow. If this milk had been sold at wholesale on the Chicago market it would have brought \$2,187. Sold, as it was, at 7 cents per quart, it brought \$570 per cow, or a total of \$4,558,—not at all bad as an income from only eight cows.

and their calves are not the kind that are given away at the present time. Results of this kind are what make enthusiastic dairy-men and turn drudgery into pleasure.

Around the World in a Cow Stable.

People do not stop to consider the amount of time that might be saved if a little more intelligence were exercised in tasks done two or three times each day. To illustrate this, take the matter of having the milk room inconveniently located. If the milker carries the milk of each cow fifty feet farther than need be, that means three rods and back each milking, or twelve rods per cow each day. If a man milks twelve cows it causes the extra labor of carrying a pail of milk seventy-two rods and carrying back the empty pail each day. In a herd of sixty cows, the milkers would walk 360 rods and back, or a total distance traveled of two and one-fourth miles per day. For a single milker it would mean 164 miles extra walking per year. If a man commenced doing this when he was fifteen years old and kept it up for fifty years, he would have walked 8,200 miles, or one-third the distance around the world. Yet all of this labor might have been saved by a little head work in planning the arrangement of the building so as to make it unnecessary to carry the milk the extra fifty feet.

If this saving of time be true with simply the operation of milking, what does it mean when all the numberless details of feeding, cleaning out stables, bedding, etc., are considered for a lifetime? It means the saving of several trips around the world for the dairyman. The dairyman who uses his brain sufficiently to fully appreciate and put into practice true dairy economy, can and should make trips around the world, but doubtless he would appreciate this traveling better if it were done in a Pullman car and ocean liner, than in his own cow stable.

Loss of One-Half in Making Poor Butter.

Still another loss of no small amount to the dairyman results from the sale of much low grade butter to the grocery, and ultimately to the renovating factories, for about one-half the

price commanded by first-class butter. The energy spent in producing the butter fat for the poor butter is just as great as in the production of that for the butter of high quality, yet the returns are only one-third as great. Why not get the other two-thirds and make the same energy return many times as much profit?

Searching the Earth for What Is Right at Hand.

People have long been studying markets and competition from other countries. Farmers have been seeking cheaper lands in less congenial locations, climates and surroundings, suffering the privations of pioneer life in a new country and depriving themselves and their families of the privileges of a developed civilization in the hope of getting a farm or earning more money. All of these questions have been much discussed in public speech and print, while the real economic agricultural problems and possibilities, right at our feet, have been largely overlooked. The problem for the people of Illinois is how to develop their own agricultural possibilities and utilize to the best advantage the human energy being expended upon their farms.

A Cow Per Acre Means Nothing.

The fundamental principle on which all agriculture is based is: "How much of a given product can be permanently obtained from an acre of land, and at what profit?" From this fundamental, basal standpoint, the dairyman's problem is: "How much milk and butter fat can be obtained per acre of land, and at what gain?"

Wherever intensive dairying has been discussed, it has usually taken the form of keeping a cow to an acre of land. What is the meaning of a cow per acre? Absolutely nothing. This brings us again to the same old misunderstood problem over which dairymen have blundered. Many think that a cow is a cow, and that ends it. We have had cows at the University of Illinois, purchased from the dairy herds of the state, one of which produced ten times as much milk and nine times as much fat as another in a year.

Present conditions show that after all of the years of scientific research, investigations, and agitation in the dairy press, the possibilities of milk production are realized by but few investigators, or the best practical men engaged in this occupation. These are strong statements, but they are nevertheless true, as must be realized when we stop to consider that the cows milked in the United States average only 150 pounds of butter fat, when they should be producing twice this amount, and so little is being done about it. Herein lies that great waste of human energy, which is astounding, and so few have awakened to a realization of this fact.

The Twenty-Acre Demonstration Dairy Farm.

A consideration of these conditions led to the starting of a twenty-acre demonstration dairy farm at the University two years ago, the sole object being to produce the maximum amount of milk and butter fat per acre, at the least cost, producing all of the feed upon this land. Briefly stated, this is a demonstration of what may be accomplished by saving the tremendous waste of energy on our dairy farms.

To Produce the Most Milk Per Acre.

Let no one get the erroneous idea that this is a "cow per acre" demonstration. As was stated before, a cow per acre means nothing, and has nothing to do with it. The object is to show the possibilities in milk production. It is much too early to draw definite conclusions, as it will require the average of several years to obtain results from which such conclusions can be drawn, but the present indications are that if every acre of the farm is made to produce a good crop every year, and this crop well harvested and saved in good condition and fed to the dairy herd every individual of which is a good, economical producer, it would multiply the present profits in milk production on our dairy farms about five times as the combined results of good tillage, good seed, good crops, well harvested and saved and intelligently fed to efficient dairy cows, are astonishingly great.

Only a few years ago grain was cheap and we drifted into an extravagant method of feeding dairy cows on a ration composed largely of concentrates, but we must now change our methods of feeding to a ration composed largely of roughage, if we are to produce dairy products most economically.

The crops raised on dairy farms are of the greatest importance; because there are boarder crops, the same as boarder cows, that do not pay for the land they occupy and the labor required to care for and harvest them. Corn and alfalfa are the two crops returning by far the most digestible nutrients per acre, and these are practically the only crops grown on this demonstration farm. The corn is nearly all put into the silo and the alfalfa is made into hay. These are grown in equal quantities, and make a balanced ration without the addition of high-priced purchased feeds, resulting in a great saving over the common method of feeding on dairy farms.

The Place of Dairying in a Permanent Agriculture.

Comparing the American grain farmer with the dairy farmer selling whole milk and getting no skim or buttermilk in return, and also raising enough young stock to replenish his herd with cows, the dairy farmer will reduce his fertility per acre exclusive of the nitrogen which is supplied by legumes, as follows:

Product	Amt. per acre, lb.	Phosphorus.	Potassium.	Total.
Milk.....	1350	\$.113	\$.097	\$.210
Old cows..	40	.034	.002	.036
Total		.147	.099	.246

The dairy farmer selling milk will reduce his fertility only one-fourth as fast as the grain farmer, and can maintain his supply of phosphorus by adding $1\frac{1}{4}$ pounds, at a cost of 3 cents per acre per year, if applied as rock phosphate, thus keeping up his fertility indefinitely, as the supply of potassium is practically inexhaustible when consumed as slowly as in dairy farming.

If we are to maintain the highest type of permanent agriculture for Illinois, dairying should be a permanent feature. As a proof of this, it is only necessary to take a glance at some of the countries of Europe. In no other country does everything give place to dairying as in Denmark or Holland, and in no other country in the world are the farmers so prosperous and self-respecting.

The Danish farmer is feeding our corn and oil cake, on higher-priced land than ours, and selling his butter on the British market in competition with ours. Let us see what the result of this is on our American agriculture. The grain farmer, raising the common crops with the ordinary rotation of corn, oats, wheat and clover, selling the grain only and plowing under the clover, which is supposed to keep up the supply of nitrogen, would remove from the soil, in grain alone, in four years, fertility per acre as follows:

Crop	Yield per acre	Market value		Total
		Phosphorus	Potassium	
Corn	55 bu.	\$1.12	\$0.63	\$1.75
Oats	50 bu.	.66	.48	1.14
Wheat	25 bu.	.72	.39	1.11
Total value for four years....		\$2.50	\$1.50	\$4.00
Average value of fertility removed per acre.....				\$1.00

On a well conducted, dairy farm, 70 pounds of butter may be produced per acre, which would contain 42-100 of a cent's worth of phosphorus and potassium. In other words, it would take the dairy farmer, selling nothing but butter, 238 years to remove as much value in fertility as the grain farmer would remove in one year, selling an average grain crop. This shows exactly what we are doing in our trade with the Danes at the present time. Which is better for American agriculture, to lose this prosperity and fertility by selling our grain to the Danes, or converting it ourselves into butter containing little or no fertility.

at 25 times the price per pound? The Dane is the best farmer in the world and the secret of his success is intensive dairy farming. Thirty years ago, Denmark could not hold her own in competition with other grain growing countries, and soon saw that dairying was her only salvation. Denmark changed from the lowest to the highest agricultural country when she changed from excessive grain farming to dairying. Now, within only a few years she is considered the most prosperous agricultural country in the world and is exporting butter to England, South America, and even to the Philippines. Her receipts from butter have increased seventeen-fold in the last thirty years. If this is the prosperity we cherish for the future agriculture of America, then live stock farming, and especially dairying, should form an important part.

This is the problem the nation must face. Illinois has a still greater question to settle. Is she going to devote her energies to producing grain and let the other states produce the dairy products? This is just what will happen to a large extent unless something is speedily done to check the present trend of grain farming. Wisconsin is, at present, largely a dairy state, and Iowa, after years of dairy slumber, is at last awakened and coming in to her own with a wonderful interest in upbuilding her dairy industry.

Struggle for Food Is Close at Hand.

The all important question for any people is, of course, its food supply, which is essentially the energy supply. To show the future possibilities in rightly conducted dairying, it seems well to give a general outlook of our future needs in regard to the food supply. This can best be done by quoting from Dean Eugene Davenport.

"The population is beginning to overtake production in this country. We have doubled our population four times a century. By twenty-five years from now, at this rate, there will be as many people living at one time and asking for food as have now lived up to this time since America was discovered. In fifty years from now we shall have the population of China in this country,

unless something goes wrong, and it is the business of agriculture to learn how to feed them, and feed them well. We have never gone up against such numbers as are just ahead. There is to be, in the very near future, a struggle for land and the food it will produce, such as the world has never yet beheld. He who knows where and how to look can see it coming. For us there are no more new worlds. For us there is little more 'out west.' " Our problem from now on is how to develop our own agricultural possibilities from the land we now possess, and there is no better way to do this than to devote a portion of it to dairy farming.

Man Cannot Eat Grass and Fodder.

The grain farmer contends that when this struggle for food comes the live stock farmer will be forced out of business because animals are expensive producers of human food, for the reason that they consume more digestible nutrients in their food than they return in animal products for the support of man. Those who hold this view fail entirely to realize that the larger portion of the energy stored in our common farm crops is scarcely more available for the sustenance of man than is the soil itself. In the crops raised in the ordinary rotation necessary for the best production of grain—corn, oats, wheat and clover,— less than half of the total digestible nutrients contained in all these crops is available for the food of man, as is shown in the table below :

Division of Human and Animal Food in Our Common Crops.

[illegible]

The by-products from all of our different agricultural crops must therefore be utilized in the feeding of farm animals. The total digestible nutrients per acre contained in the grain of these crops for the four-years' rotation, amounts to 4,615 pounds, while the total digestible nutrients contained in the roughage of these same crops is 4,978 pounds, or nearly one-tenth more. But the grain farmer says cows cannot consume all of the roughage because it is too bulky. This is true, but when the coarse bran of the corn and wheat is removed from the portion available for man, and fed to the cow, she needs to consume only one-third of the wheat straw and one-half of the oat straw to eat half the digestible nutrients in all these farm crops. This leaves the greater part of the straw available for bedding and the absorption of the liquid manure, which, if properly conserved and applied to the land, would still contain 67.5 percent as much organic matter to plow under for the protection of future crops as would all of the roughage produced, had none been fed, as shown by the table below.

**Roughage Available to Plow Under to Increase the Humus in the Soil,
Under Systems of Grain and Live Stock Farming.**

Crop.	Exclusive grain farming	Animal farming where all corn stover and clover hay, one-half oat straw, and one-third wheat straw are fed to cows.
Corn stover	4000	2700 •
Wheat straw	2000	{ 2-3 not fed 1333 1-3 fed 420
Oat straw	1600	{ 1-2 not fed 800 1-2 fed 475
Clover hay	5000	2785
Total	12600	8513 67.57%

If careful methods are used in every step, all of the fertility that is not returned to the soil is converted into food for the support of man, which, under the conditions we are discussing, is the ultimate aim of all agriculture.

A good flow of milk can be obtained from simply feeding corn stover, clover hay, and the bran from corn and wheat, together with some straw. On a feeding experiment at the University, several cows produced as high as 40 pounds of milk per day for fifty days, on corn silage, alfalfa hay, and straw, and there is no question but what this is an economical method of milk production. A race of dairy cows can undoubtedly be developed that will produce, on a ration composed largely of roughage, much better than these did, because these cows not only descended from a line of heavy grain fed cows, but up to this time had been fed a high grain ration themselves—as much as 20 pounds of grain per cow per day.

It has been generally assumed that animals will keep getting fewer in number as the population becomes more dense, but this is not necessarily true if we are to maintain a high type of civilization, which, after all, should be the highest aim of humanity. Whether or not the world finally becomes stocked with the actual maximum number of people the soil is capable of keeping alive, regardless of their degree of civilization, will depend upon the standard of the masses.

From these facts it is seen that animals must be considered in our future intensive farming methods, or a large amount of the nutritive value of our agricultural crops will be wasted. As the demand for human food becomes greater, it will be increasingly important to feed these products to such animals as are capable of returning the largest possible percentage of the energy which the coarser food contains.

Wherever the density of population actually taxes the power of the land to supply sufficient food of any kind to nourish the people, clover has been grown. Yet of course it is possible to raise some other legume, as beans or peas, which would also furnish human food in the form of concentrates. Yet were this done, there would still be a large amount of leguminous roughage to be fed green, made into silage, or dried into hay for the dairy cow.

The Dairy Cow Leads in Survival of the Fittest.

Since the cow is the most economical producer of human food of all of our domestic animals, and as she can live and produce milk on a ration composed entirely of roughage, she will be the animal that will be resorted to in order to convert half of the energy of our common crops, which is otherwise unavailable, into human food. Another reason why the cow is here to stay, and will always be of vital importance in sustaining human life, is that babies and invalids cannot be nourished on corn meal mush alone. For these reasons, even after the time comes that there is an actual struggle for human food, the dairy cow will still be a vital and abiding factor in a system of permanent agriculture, if we are to retain a high degree of civilization.

Importance of Brainy Leaders.

A few brainy, energetic men devoting their efforts to dairying tends to the highest development of this occupation in any community, for the mass of people are great imitators, and learn better methods by following the example of their most progressive neighbors. In some dairy sections are found poor cows, poorly fed and cared for, poor buildings and poor farming in general, while in other sections the dairy conditions, as a whole, are excellent, due to following the practices of a few live, progressive dairymen in the community, who are the guide posts on the road to successful dairying.

It has been said that the cities would not last long were they not supplied with new brain and vitality from the farm. How many people have given serious consideration to the real meaning of this constant drain of the best brain from the farm to the city, which has been going on for many years, and its significance and serious effect upon the development of our agriculture? The city has been developed to the neglect and at the expense of the country.

Three Things the Boy Wants to Know.

The familiar saying, "It is hard to teach an old dog new tricks," is all too true. It is the young men in dairying today that must be looked to for advancement and the improvement of

the dairy conditions and methods. How can the best boys be prevented from leaving the farm? There are three essential things which must be demonstrated to the average bright American farm boy to make him stay on the farm: First, that there are, on the whole, possibilities for as great an income on the farm, with the same expenditure of energy and brain, as in other callings; second, that farm life may be made attractive and robbed of its old-time drudgery; and third, that the honors to be attained by the farmer, and the recognition given him, are as great as in the professions in the city.

With the increased yields now being secured by the most progressive, and the practice of business methods, the man on a dairy farm may have an income that will enable him to develop the other two requirements.

Drudgery and Discouragement Are the Worst Side.

The most serious side of the poor cow question, after all, is not the money she loses, but the drudgery she causes through waste of energy bestowed upon her, which discourages and disheartens not only the owner, but drives all of the bright boys from the farm. The way to attach the boy to the farm is by achievement. Think of the energy wasted by a man, and his family who keep a herd like the one shown in the first table,—and there are many such. The children in this family learn, all too early, the meaning of drudgery and discouragement. The only way a man with a herd as poor as this can hold the business together at all is by having his children do a large amount of the milking and other work, for which they receive no compensation whatever. Add to this poor crops, which naturally follow this sort of dairying, and then go still further and think of the millions of needless steps taken in caring for the herd and its product, due to barns poorly arranged for doing the work conveniently, and you have the picture of a life, sad in the extreme.

The Desolate Home.

The desolate home—no paint on the house, no honeysuckle over the door, and no time or money for the comforts within that go to make a house a home,—such conditions are far-reach-

ing in their degrading effects, especially upon children. No amount of schooling can dim the memory or change the effect on the boy of such a home, for the picture that is burned into that boy's brain lives forever. Is it any wonder a boy raised under these conditions hates the sight of a cow, and even the farm itself, and is going to get away from it forever at the earliest opportunity?

Home Picture That Holds the Boy.

Fortunately, in direct contrast to this, there are other farm homes supported by dairy herds paying large profits, where the enthusiasm of the father has spread to the children. Surrounding these homes are neatly mowed lawns, with flowers, trees and vines around the painted, well-kept house; and where money is spent for home comforts. Here the question of how to keep boys on the farm never arises.

We are asking for a higher civilization, but civilization costs something, and in order for a man to raise himself in the scale of civilization he must increase his earning power. The possibilities of increased yield and income from rightly conducted dairying, is the lesson sought to be impressed upon the younger dairymen, and with this comes the wonderful stimulation of an interest in the things which concern the farm.

Wanted—Intelligent, Enthusiastic Men.

More intelligent, enthusiastic men on the farm, is a crying need in agriculture today. Our century can show no greater glory than the awakening of an intelligence in relation to the work of the farm. If this can be generally accomplished, it will be the biggest thing that ever happened. For real meaning it will surpass any educational movement that has yet swept any country, as the final result would be a saving of human energy which would be of even greater consequence than the conserving of our forests and mines.

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